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GOVERNOR OF HAWAII



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
**COMMISSION ON WATER RESOURCE MANAGEMENT**  
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DEC 24 1997

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Dear Parties:

Enclosed is the Commission's Findings of Fact, Conclusions of Law and Decision and Order for the Waiahole Ditch Combined Contested Case Hearing.

The decision was rendered without the assistance of counsel after the Commission's attorney was dismissed.

A handwritten signature in cursive script, reading "Michael D. Wilson", written over a horizontal line.

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DAVID NOBRIGA, Commissioner

COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII

In the Matter of	)	Case No. CCH-OA95-1
Water Use Permit Applications,	)	
Petitions for Interim Instream	)	
Flow Standard Amendments, and	)	FINDINGS OF FACT,
Petitions for Water Reservations	)	CONCLUSIONS OF LAW, AND
for the Waiahole Ditch Combined	)	DECISION AND ORDER
Contested Case Hearing	)	
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APPENDIX A Rulings on the Proposed Findings of Fact Submitted by the Parties

IV. CONCLUSIONS OF LAW

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LOCATION MAP

## KEY TO ABBREVIATIONS

ABBREVIATION	DEFINITION
ALISH	Agricultural Lands of Importance to the State of Hawaii
Amfac/JMB	Amfac/JMB Hawaii, Inc.
BLNR	Board of Land and Natural Resources
BWS	City and County of Honolulu Board of Water Supply
C & C of Honolulu	City and County of Honolulu
Campbell Estate	The Estate of James Campbell
CIP	Capital Improvement Projects
Commission	Commission on Water Resource Management
COWRM	Commission on Water Resource Management
CUP	Conditional Use Permit
CWRM	Commission on Water Resource Management
DAR	Division of Aquatic Resources
DHHL	Department of Hawaiian Home Lands
DLNR	Department of Land and Natural Resources
DOA	Department of Agriculture
DOE	Department of Education
DOH	Department of Health
Dole/Castle & Cooke	Dole Food Company, Inc., Castle & Cooke, Inc.
DWWM	Department of Wastewater Management, City & County
EPA	Environmental Protection Agency
FOF	Findings of Fact
GAD, gad	Gallons of water per acre per day
Gentry	Gentry Development Company
GIS	Geographical Information System
Halekua	Halekua Development Corporation
HAR	Hawaii Administrative Rules
Haw. Rev. Stat.	Hawaii Revised Statutes
Hawaiian Foliage	Hawaiian Foliage and Landscape

<b>ABBREVIATION</b>	<b>DEFINITION</b>
HFDC	Housing Finance and Development Corporation
HFP	Hawaii Food Products, Incorporated
HRS	Hawaii Revised Statutes
HSA	Hawaii Stream Assessment
HSPA	Hawaiian Sugar Planters Association
HTF	Hawaii's Thousand Friends
Huliwai	Huliwai Tropical Plantations, Limited
IIFS	Interim Instream Flow Standard
KNB	Kahalu‘u Neighborhood Board
Koei	Koei, Inc.
Ko Olina	Ko Olina Resort
KSBE	Kamehameha Schools/Bernice Pauahi Bishop Estate
LCA	Land Commission Awards
LUC	Land Use Commission
LURF	Land Use Research Foundation
MGD, mgd	million gallons per day
Mililani Group	Mililani Group, Inc.
Nakamas	Eiko and Charlene Nakama
Navy	Department of the Navy
NIH	Nihonkai Lease Company
Nihonkai	Nihonkai Lease Company
OHA	Office of Hawaiian Affairs
Ohana	Hakipu‘u Ohana
OSCO	Oahu Sugar Company, Ltd.
OSP	Office of State Planning
OWMP	Oahu Water Management Plan
PLC	Pacific Landscape Corporation
PMI	Puu Makakilo, Inc.
ppm	parts-per-million



<b>ABBREVIATION</b>	<b>DEFINITION</b>
Project	Waiawa by Gentry Project
Proposed Bifurcation Order	Proposed Order to Bifurcate Water Use Permits for Pearl Harbor Groundwater from the Contested Case Hearing
Puu Makakilo	Puu Makakilo, Inc.
Robinson	Robinson Estate
ROR	Royal Oahu Resort
Royal Oahu	Royal Oahu Resort
Sports Shinko	Sports Shinko Mililani Company, Limited
State	State of Hawaii
TDS	Total Dissolved Solids
TMK	Tax Map Key
Tr., TR.	Transcript
TRD	Technical Reference Document
UH-WRRC	University of Hawaii Water Resources Research Center
UIC	Underground Injection Control
USGS	United States Geological Survey
WBE	West Beach Estates
WDT	Written Direct Testimony
WIC	Waiahole Irrigation Company
WRRC	Water Resources Research Center
WRT	Written Rebuttal Testimony
WST	Written Surrebuttal Testimony
WUPA	Water Use Permit Application
WWM	Department of Wastewater Management
WWTP	Wastewater Treatment Plant
WWCA	Waiahole-Waikane Community Association
12-MAV	Twelve month moving average

# COMMISSION ON WATER RESOURCE MANAGEMENT

## STATE OF HAWAII

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Water Use Permit Applications,)		
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Flow Standard Amendments, and	)	FINDINGS OF FACT
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### FINDINGS OF FACT, CONCLUSIONS OF LAW, DECISION AND ORDER

#### I. INTRODUCTION

The Commission on Water Resource Management (Commission or CWRM) administers the State Water Code, Chapter 174C, Hawaii Revised Statutes (Haw. Rev. Stat.) (1987). In addition to its other powers and duties, the Commission is authorized to: 1) "designate water management areas for regulation under this chapter where the Commission .... finds that the water resources of the areas are being threatened by existing or proposed withdrawals of water." Haw. Rev. Stat. § 174C-5(2); 2) "establish an instream use protection program designed to protect, enhance, and reestablish, where practicable, beneficial instream uses of water in the State." Haw. Rev. Stat. § 174C-5(3); 3) "plan and coordinate programs for the development, conservation, protection, control, and regulation of water resources based upon the best available information, and in cooperation with federal agencies, other state agencies, county or other local governmental organizations, and other public and private agencies created for the utilization and conservation of water." Haw. Rev. Stat. § 174C-5(12); and 4) require permits for "any withdrawal, diversion, impoundment, or consumptive use of water in any designated water management area." Haw. Rev. Stat. § 174C-48(a).

This contested case hearing involves three different and competing kinds of applications to use water from the Waiahole Ditch system: 1) water use permit applications resulting from the designation of the windward Oahu aquifer systems as ground-water management areas in May 1992; 2) applications to restore water to windward Oahu streams by amending the interim instream flow standard for windward Oahu; and 3) petitions for reservations of windward Oahu ground water. Protection of traditional and customary Hawaiian rights and principles of the Public Trust Doctrine (both incorporated into the State Water Code) are also implicated.

The interim instream flow standard for windward Oahu streams is linked with the water use permit applications because the base flows of windward Oahu streams and the development tunnels of the Waiahole Ditch system develop water from the same high level aquifers in dike intruded lavas. Petitions for reservations of water are related to water use permits because the procedure to reserve

water applies only in water management areas.

This document begins with a brief summary of the regulatory background from the adoption of the interim instream flow standard for windward Oahu streams in April 1989, to the closing arguments presented in September 1996.

The findings of fact begins with a section on the history and chronology of the Waiahole Ditch system and a more detailed account of the proceedings. It also includes sections on the interim instream flow amendment petitions, water use permit applications, petitions for reservations of water, the Public Trust Doctrine, the protection of traditional and customary Hawaiian rights, and other related issues of concern on which evidence was presented during the course of the hearings.

Next, the conclusions of law outline the legal framework and apply Hawaii's water law to the findings of fact.

Finally, the Commission having weighed all the evidence presented, seeks a balanced solution to obtain the maximum beneficial use of the waters of the State while providing protection of traditional and customary Hawaiian rights, the protection and procreation of fish and wildlife, the maintenance of proper ecological balance and scenic beauty, and the preservation and enhancement of waters of the State, within the public interest objectives of the State Water Code. In its decision and order the Commission: 1) acknowledges the existing and potential instream values and uses of water, applies the principles of the Public Trust Doctrine, and protects traditional and customary Hawaiian rights (as they relate to the State Water Code) by amending the interim instream flow standard to restore water to windward Oahu streams; 2) recognizes the present and potential uses of water from the stream for non-instream purposes, including the economic impact of restricting such uses, by issuing water use permits for agricultural and other uses and by proposing an agricultural reserve based on past agricultural uses of Waiahole Ditch system water; 3) provides a non-permitted ground water that will remain in windward streams but may be available for new non-agricultural uses or for agricultural uses (which exceed the proposed agricultural reserve), provided that further withdrawals do not significantly degrade the streams; and 4) orders the establishment of technical advisory committees to address specific areas of concern and make recommendations to the Commission for action.

## **II. BACKGROUND**

On April 19, 1989, the Commission adopted the Interim Instream Flow Standard (IIFS) for all windward Oahu streams as "that amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted offstream through new or expanded diversions, and under the stream conditions existing on the effective date of the standard." (effective May 4, 1992) In essence, the IIFS provides that no additional diversions from the "status quo" shall be made without Commission approval. A restoration of stream flows above the "status quo" also requires Commission approval.

On May 5, 1992, the Commission designated the five aquifer systems of windward Oahu as

ground-water management areas. Notice of the action was published on July 15, 1992, the effective date of designation. Under the Water Code, users of ground water must apply for a water use permit within one year of the effective date of designation.

In June 1993, the Waiahole Irrigation Company (WIC) filed a combined water use permit application for all the then-existing water users of the Waiahole Ditch water transported to Central Oahu.

On August 4, 1993, Oahu Sugar Company (OSCO) announced that it would cease its sugar operations by 1995.

On November 4, 1993, the Department of Agriculture (DOA) petitioned the Commission "to reserve the present use flow of the Waiahole Ditch system for agricultural uses.....to take effect upon the demise of the Oahu Sugar Company's operations". Petitions to reserve water under Haw. Rev. Stat. § 174C-49(d) were later filed by the Office of Hawaiian Affairs (8/31/94); the Kahaluu Neighborhood Board No. 29, the Hakipuu Ohana, and the Waiahole-Waikane Community Association (9/26/94); Kamehameha Schools/Bishop Estate (12/15/94); and the Department of Hawaiian Home Lands (1/25/95).

On December 7, 1993, the Kahaluu Neighborhood Board No. 29, the Hakipuu Ohana, and the Waiahole-Waikane Community Association petitioned to amend the interim instream flow standard for windward Oahu streams affected by the Waiahole Ditch. The Office of Hawaiian Affairs also petitioned to amend the interim instream flow standards for windward streams on February 28, 1995.

In response to complaints received at its May 18, 1994 meeting, the Commission investigated releases of Waiahole Ditch water into central Oahu gulches.

The Commission visited the Waiahole Ditch irrigation system on June 21, 1994, and the Reppun taro farm in Waiahole on July 13, 1994.

On June 22, 1994 and July 26, 1994, the Commission held public informational meetings at Waiahole Elementary School and Waipahu High School, respectively, to inform the public about the issues involved in this matter and to receive testimony from the public.

At the Commission's August 17, 1994 meeting, staff presented a status report on Oahu Sugar Company's releases of water from the Waiahole Ditch.

At its September 28 and October 19, 1994 meetings, the Commission considered an "Order to Show Cause to Waiahole Irrigation Company Why It Should Not Be Ordered To Cease Wasting Water". The Commission deferred action on the matter and asked the interested groups to enter into expedited mediation of the release issue in lieu of holding a contested case hearing.

In October 1994, several parties submitted requests for contested case hearings on the petition

to amend the interim instream flow standard for windward Oahu streams affected by the Waiahole Ditch system.

At its November 16, 1994 meeting, the Commission authorized a special meeting to be called if the mediation process resulted in a consensus recommendation by December 15, 1994. If a consensus recommendation could not be reached by December 15, 1994, the contested case hearing on the release issue would commence.

Mediation on the Waiahole interim release issue was held on November 21, 1994, and in numerous sidebar meetings following. Seventeen parties agreed to participate in the mediation conducted by Peter S. Adler.

On December 16, 1994, the Commission adopted a Mediation Agreement, Waiahole Ditch Interim Water Releases, signed by most of the Waiahole Ditch water users, applicants, and petitioners to allow 8 million gallons per day (mgd) to flow past the North Portal in the Waiahole Tunnel and release the remainder back into the windward streams.

The Commission, on January 25, 1995, ordered that a combined contested case hearing be held on 1) all related applications for water use permits, 2) all related petitions to reserve water, 3) the petitions to amend the interim instream flow standards, and 4) any other matters related to the Waiahole Ditch system.

A public hearing for the Waiahole Ditch Combined Contested Case Hearing was held on April 18, 1995. All interested persons and organizations were given the opportunity to testify or present information on Waiahole Ditch matters, and were given the opportunity to request to be an intervening party, orally or in writing, by the end of the public hearing.

On May 17, 1995, the Commission gave all applicants the opportunity to be heard orally and/or in writing, and gave anyone objecting to the standing of any applicant the opportunity to submit such objections in writing and/or orally. The Commission granted standing to twenty-five parties and denied standing to nine parties, as explained in Order Number 1, Order Granting and Denying Applications to Participate in the Combined Contested Case Hearing, issued on May 30, 1995, and Order Granting Ka Lahui's Motion to Reconsider Standing in the Waiahole Combined Contested Case Hearing, issued on July 13, 1995.

From May 22, 1995 to November 8, 1995, there were seventeen meetings which included six prehearing conferences, a field investigation, four hearings on existing uses, and six hearings on motions.

On November 9, 1995, the parties began their opening statements and presentation of evidence. The hearing continued to August 21, 1996, during which time there were fifty-two days of hearings including four evening sessions. The parties presented written testimony from 161 witnesses, of which 140 testified orally. There were 567 exhibits introduced into evidence. Closing arguments were presented during three days, from September 18 to 20, 1996.

The Commissioners hearing the case from the initial public hearing in April 1995, included

Michael D. Wilson, Dr. Lawrence Miike, Robert S. Nakata, Richard H. Cox, Robert G. Girald, and David Nobriga. Commissioner Girald disqualified himself in June 1995. Commissioner Nakata's term ended on June 30, 1995. Newly appointed Commissioner Herbert M. Richards joined the hearing on September 25, 1995, and later recused himself on January 10, 1996. Commissioners Wilson, Miike, Cox, and Nobriga were present for the entire proceedings and reviewed all of the evidence.

### **III. FINDINGS OF FACT**

The parties submitted a total of 2,997 proposed individual findings of fact. Appendix A lists the Commission's rulings on the proposed findings of fact submitted by the parties and indicates whether they are accepted or rejected. The findings of fact numbers of the various parties are in brackets. The following findings of fact are accepted as modified or as otherwise noted. Modifications were made for clarification and accuracy, and are in the Ramseyer Format. Deletions are in brackets and additions are underlined. Both deletions and additions are in bold type.

#### **A. History/Chronology**

Section A begins with a brief history of the Waiahole Ditch system, discusses the complaint of water being wasted after OSCO closed its sugar cane operations and the subsequent Interim Release Agreement, and outlines the prehearing steps that were taken which led to the combined contested case hearing, including the determination of standing to participate in the hearing, the existing use hearings, the existing use order, the proposed order to bifurcate Kamehameha Schools/Bernice Pauahi Bishop Estate's (KSBE) water use permit applications from the proceedings, and the filing of testimonies and motions. The contested case hearing started on November 9, 1995 and continued to August 21, 1996. The closing oral arguments were presented from September 18 to 20, 1996.

The Waiahole Ditch and tunnel system was conceived about 1905 as a way to transport surface water from the wetter windward side of the island to the sugar cane fields on the drier leeward side. The main tunnel portion of the system was constructed through the Koolau mountains from 1913 to 1916. Though originally designed to transport surface waters, high level, dike impounded ground water was encountered during the construction of the tunnel. Between 1925 and 1935, the Kahana, Waikane #1, Waikane #2, and the Uwau Main Tunnels were developed to collect the high level water. In 1964, the Uwau Tunnel was extended 177 feet past the crest of the Koolau Range. As the system collected more dike water, it collected less surface water. Presently, many of the surface water intakes have been closed off, and the major ones that exist are in Kahana Valley. The Waiahole Ditch system flow averaged 32.67 mgd, measured at Adit 8 where the main tunnel exits the Koolau Mountains, during the period from 1938 to 1978. The flow averaged 28.5 mgd at Adit 8 for the period from 1989 to 1993. Factors contributing to the decreased flow include the closing off of the surface water intakes and because pumping from Waiahole Stream into the ditch system had ceased. The Kahana bulkhead was installed in early 1992 and reduced the ditch flow from the Kahana Tunnel by about

1.5 mgd. Therefore, a conservative estimate of the present flow at Adit 8 would be about 27 mgd. When OSCO was in full production, about 4,000 acres of sugar cane lands were irrigated by the Waiahole Ditch water.

## **1. Waiahole Ditch and Tunnel System**

1. The Waiahole Ditch and tunnel system consists of dikewater development tunnels, surface water intakes, open ditches, gates, flumes, siphons, roads, trails, camps, support shops, etc. The system starts at Kahana Valley in windward Oahu, collects primarily groundwater and some surface water through a series of development tunnels in the Koolau Mountains, and transports the non-potable water to Central and Leeward Oahu primarily for agricultural purposes. (Hatton Exhibit A-1, at 4-5). [KSBE FOF1, WIC FOF35]

2. When OSCO was in full production, there ~~[was]~~ **were** about 4,000 acres of sugar cane lands which were irrigated with Waiahole Ditch water. Hatton, WDT, 9/18/95, P7, Lines 4,5. [CWRM FOF1]

3. The total length of the Waiahole Ditch system is approximately twenty-five (25) miles stretching from Kahana Valley to the Leeward plains. (Hatton Tr. 11/29/95 at 58, lines 12-13) [KSBE FOF596]

4. The idea of delivering fresh water from the Windward to the Leeward side of the island was conceived about 1905. Prior to construction of the ditch system, various agreements and easements were obtained from private and public entities to allow the system to be built. Construction of the system began in 1913 and was completed in 1916. (Hatton Tr. 11/29/95 at 45, lines 17-24). [KSBE FOF4, WIC FOF37]

5. The main tunnel of the Waiahole Ditch system was constructed between 1913-1916 as a way to transport water to irrigate Oahu Sugar Company, Ltd.'s ("OSCO") sugar cane fields in Central Oahu. (Hatton Exhibit A-1, at 2). [KSBE FOF2, WIC FOF36]

6. At that time, when the system was initially constructed, the system was designed to collect surface waters from surface water intakes on the Windward side of the island and the water would be transported through a trans-Koolau tunnel which also developed additional waters. (Hatton Tr. 11/29/95 at 45, line 25; at 46, line 1-6). [KSBE FOF5, WIC FOF44]

7. The Waiahole Ditch System affects the following four (4) groundwater aquifers: (1) the high level aquifers in dike intruded lavas which extend both Windward and up to one and one-half (1 1/2) miles Leeward of the Koolau Crest. Some of these high level aquifers are tapped by the development tunnels of the Waiahole Ditch system (Lum Tr. 12/13/95 at 168, lines 12-17); (2) the Pearl Harbor Basal Aquifer of Central Oahu which includes the Waipahu-Waiawa aquifer. This

aquifer has been partially recharged by the flows of the Waiahole Ditch system by irrigation return water from sugar cane lands cultivated by OSCO and currently from irrigation return water from existing diversified agricultural uses on the Leeward side of the Koolau Crest (Lum Tr. 12/13/95 at 168, lines 18-23) (Lum WDT [9/18/96] 9/18/95 at 6, lines 13-22); (3) the Waianae Basal Aquifer and now called the Ewa-Kunia Aquifer. The aquifer has been recharged in the past by irrigation return water **[and] over** sugar cane lands by **[both]** OSCO roughly west of Kunia Road (Lum Tr. 12/13/95 at 168, lines 24-25, at 169, lines 1-3); and (4) **indirectly** the Pearl Harbor **(now called Ewa)** Caprock Aquifer, **which** has been recharged in the past by irrigation return water from sugar cane lands cultivated by OSCO. (Lum Tr. 12/13/95 at 169, lines 4-8) (Lum WDT [9/18/96] 9/18/95 at 7, lines 3-9). [KSBE FOF6]

8. Between 1925 and 1935, the Kahana, Waikane #1, Waikane #2 and the Uwau Main Tunnels were developed to collect dike impounded water. Hatton, WRT, 10/16/95, P2-3. As the system collected more dike water, it collected less surface water. Thus, except between 1925 and 1935 when the development tunnels were under construction, the amount of water flowing through the Ditch system has been relatively constant from 1916 through 1994. Hatton, WRT, 10/16/95, P3. [WIC FOF45]

9. In 1964, the Uwau tunnel was extended 177 feet past the crest of the Koolaus into Waipio lands owned by Castle & Cooke. Hatton, WDT, 9/18/95, P2. [WIC FOF46]

10. The system **[comprises] is comprised** of two (2) major parts. The collection part of the system consists almost entirely of tunnels starting from Kahana and running through Waiawa. This is where the water is collected. The delivery part of the system starts from Adit 8 and runs downstream to the Leeward plains. (Hatton Tr. 11/29/95 at 47, lines 1-25) [KSBE FOF9]

11. Regarding the collection part of the system, the system begins in Kahana Valley and this portion of the system is under lease from the State of Hawaii ("State"). Here, the Kahana Development Tunnel, as do all the other development tunnels, has a gauge at the exit of the tunnel. The average water developed from this tunnel for the period 1989 through 1993 was 2.6 million gallons per day ("MGD"). In addition, there was about an additional 2.1 MGD of surface water that is also collected for the system, giving the total waters collected from Kahana of about 4.7 MGD. In early 1992, a bulkhead was installed at the Kahana Development Tunnel by the State of Hawaii. (Hatton Tr. 11/29/95 at 48, lines 7-25; at 49, lines 1-20). [KSBE FOF10, WIC FOF47a,f]

12. The average flows for the period 1989 to 1993 were selected because the flows were neither extraordinarily high nor were they extraordinarily low, and it was also after pumping from Waiahole Stream into the ditch system had ceased. Hatton, Tr., 11/29/95, page 48, lines 8-13. [CWRM FOF2]



13. Presently, many of the surface water intakes have been closed off, and the only major ones that exist are in Kahana Valley. Hatton Tr. 11/29/95, page 49, lines 12-15. [CWRM FOF3]

14. The State of Hawaii owns the land in Kahana and Waiahole on which some of the water collected by the Waiahole Ditch system is developed. WIC has a lease agreement GL-S4329 with the State for the development of this water. Hatton, WDT, 9/18/95, P3. [WIC FOF38]

15. After the Kahana bulkhead was installed in early 1992, ditch flows from Kahana **[has] have** been reduced by approximately 1.5 MGD **to 1.1 mgd from a total of 2.6 mgd.** (Hatton Exhibit A-R-103) [KSBE FOF11, WIC FOF48]

16. At Waikane, there are two (2) development tunnels: Waikane One Development Tunnel which develops approximately 4.2 MGD; and Waikane Two Development Tunnel which develops approximately 1.1 MGD. At this point in the system, the total waters developed, including the Kahana waters **(2.6 mgd from the tunnel plus 2.1 mgd surface = 4.7 mgd)**, were approximately 10 MGD. (Hatton Tr. 11/29/95 at 49, lines 21-25; at 50, lines 1-6). [KSBE FOF12, WIC FOF47b,c]

17. The system then enters the lands of Uwau and Waianu which are owned in fee simple by WIC. Here, the Uwau Development Tunnel has two (2) components: the original Uwau Tunnel; and its extension built in 1964. Based upon two (2) gauges at this tunnel, the total water developed here is approximately 13.5 MGD. Therefore, adding such water with the 10 MGD developed at Kahana and Waikane, the total water developed at this point is 23.5 MGD. (Hatton Tr. 11/29/95 at 50, lines 7-25; at 51, lines 1-25). [KSBE FOF13, WIC FOF40, WIC FOF47d]

18. Approximately 8.7 mgd is developed in the main part of the Uwau Development Tunnel, on the windward side of the Koolau crest, and another 4.8 mgd is developed in the Uwau Tunnel extension, on the leeward side of the Koolau crest, for a total of 13.5 mgd. (Hatton Testimony A-1, 9/18/95, page 5, lines 6 to 8) [CWRM FOF4]

19. The total water developed between the lands of Uwau and Waianu and North Portal which is directly underneath the crest of the Koolaus was approximately 1.3 MGD for the period 1989 through 1993. As such, the system to this point for the period of record developed approximately 24.8 MGD. (Hatton Tr. 11/29/95 at 50, lines 6-22). [KSBE FOF14, WIC FOF47e]

20. Beyond the North Portal, the **[system wide]** tunnel then **[goes downstream]** **descends** and enters into the lands of Waiawa, which are owned by Kamehameha Schools/Bernice Pauahi Bishop Estate ("KSBE"). (Hatton Tr. 11/29/95 at 53, lines 3-10) [KSBE FOF15]

21. WIC has a perpetual easement across lands in Waiawa owned by

Kamehameha Schools Bishop Estate ("KSBE") through which the Waiahole Ditch system runs. In return, KSBE has the right to use the system in common with WIC to transport all of the waters developed on KSBE lands for KSBE's own use. Hatton, WDT, 9/18/95, P3. [WIC FOF41]

22. WIC also has **[perpetual easements] water collection or easement rights** across lands through which the Waiahole Ditch system runs that are owned by either Castle & Cooke, the United States **Military**, the State of Hawaii, SMF Enterprises, Inc. or Robinson Estate. Hatton, WDT, 9/18/95, P4. [WIC FOF42]

23. WIC, either as WWC (**Waiahole Water Company**) or WIC, has continually owned, maintained, managed and operated the Waiahole Ditch system since its inception. Hatton, WDT, 9/18/95, P2. [WIC FOF43]

24. The water tunnel that runs through KSBE's lands in Waiawa is also known as the Waiahole Main Bore. The length of such system is about 14,500 feet and the elevation is approximately 724 feet at the south portal Adit 8, and 754 feet at the North Portal. (Chuck Tr. 12/14/95 at 71, lines 7-13). [KSBE FOF16]

25. The Trans-Koolau Tunnel or the Waiahole Main Bore develops groundwater. (Lum Tr. 12/13/95 at 169, lines 4-8) (Lum WDT 9/18/96 at 7, lines 3-9). [KSBE FOF261]

26. On February 4, 1957, George Hirashima of the U.S. Geological Survey and his team made a series of flow measurements within the main bore of the Waiahole Ditch and found that the total gain in flows leeward of the Koolau Crest was 6.54 MGD or 72.8 percent of the total flow at Adit 8 which on that day, February 4, 1957 amounted to 8.98 MGD. (Lum Tr. 12/13/95 at 169, lines 13-19). The remaining 27.2 percent or 2.44 MGD originates in the section of the Waiahole main bore between the north portal and the north portal gate. (Lum Tr. 12/13/95 at 183, lines 8-11). [KSBE FOF262]

27. In other words, the 8.98 MGD figure is a particular measurement of water emanating from the entire Waiahole Main Bore on a particular day. The 6.54 MGD figure is also a one day measurement between the north portal gauge and Adit 8 while the 4.2 MGD figure is a numerical average of the incremental gain in flow between the north portal gauge and Adit 8 over a twenty-four (24) year period. Such 4.2 MGD average figure, which KSBE is requesting, **[emanates entirely from the Leeward side] assumes the hydrologic divide coincides with the location of the crest of the Koolau range**. (Lum Tr. 12/13/95 at 182-87). [KSBE FOF263]

28. Mr. Hirashima's measurements did not include any surface water or any groundwater from the rest of the ditch system. The measurement only included the groundwater flowing within the Waiahole Main Bore, because all flow arriving at the North Portal of the tunnel was diverted away from the main bore. (Lum Tr. 12/13/95 at 169, lines 20-24). [KSBE FOF264]

29. The North Portal is a measuring station on the Waiahole system that directly **[underlines] underlies** the crest of the Koolau Mountains. The area located from the North Portal to Adit 8 is on the Leeward side of the Koolau Mountains. The average gain in the ditch from North Portal to Adit 8 is about 5 MGD. So that water would be derived from essentially the Leeward side of the Koolau Mountains. (Meyer Tr. 02/15/96 at 25, lines 23-25; at 26, lines 1-4). [KSBE FOF266]

30. With regard to the quantity of water developed from the KSBE's Waiawa lands where the main bore tunnel of the ditch system was constructed, this flow has been measured for many years by taking the difference between the total quantity of water passing through the North Portal crest gauge station and the gauging station at the Leeward end of the main bore at Adit 8. For the period of record from 1970 to 1993, the total average flow from the dike compartments was approximately 4.2 MGD. (Chuck Tr. 12/14/95 at 71, lines 23-25; at 72, lines 1-14). For the period of record from 1989 through 1993, the total average water developed at the Waiahole Main Bore was 3.7 MGD. (Hatton Tr. 11/29/95 at 53, lines 3-10; Chuck, Tr. 12/14/95 at 72, lines 15-18). As such, the total water developed from the collection portion of the system **(at Adit 8)** from the period 1989 to 1993 was approximately an average of 28.5 MGD **(24.8 + 3.7 = 28.5)**. (Hatton Tr. 11/29/95 at 53, lines 16-18). [KSBE FOF17, WIC FOF47g]

31. The Waiahole Ditch system, like any other water development and transportation system, experiences system losses in the form of evaporation[,] **and** leakage from the lined ditch, from the siphons, and from the pipelines. Hatton, WDT, 9/18/95, P14-15. [WIC FOF49]

32. Waiahole Valley receives approximately 500,000 gpd from the Waiahole Ditch system through the McCandless pipeline. Hatton WDT, 9/18/95, P6. [WIC FOF50]

33. WIC purchased from McCandless the rights to collect all water, except 500,000 gpd, in Waikane above the 450-foot elevation. The Waikane property is now owned by SMF Enterprises. Hatton, WDT, 9/18/95, P3. [WIC FOF39]

## **2. Complaint, Mediation, and Interim Agreement**

34. In response to complaints that Waiahole Ditch water was being wasted following the closing of Oahu Sugar Company's ("OSCO") sugar cane operations, the Joint Applicants, WWCA, OHA, DOA, Hawaii's Thousand Friends, Hawaii Farm Bureau and Del Monte Fresh Produce (Hawaii), among others, participated in mediation which resulted in a mediation agreement, and a Decision and Order issued by the Commission on December 19, 1994, in Docket No. C-OA94-22B (the "Interim Release Agreement"), providing that for a period of six months following the Order, WIC would continue to provide a consistent flow of 8 mgd to the Waiahole Ditch as measured at the North Portal, and would release the surplus of that amount into the Windward streams. See Decision and Order, December 19,

1994, Docket No. C-OA94-22B. [WIC FOF81]

### **3. Combined Contested Case Hearing**

35. At its January 25, 1995 meeting, the Commission ordered a combined contested case hearing on the Joint WUPA and other various water use permit applications, petitions for water reservation and petitions to amend IIFS. See Public Notice, dated January 30, 1995 (published February 3 and 10, 1995). [WIC FOF82, KSBE FOF35]

36. On March 2, 1995, notice regarding the public hearing on matters related to the Waiahole Ditch was provided pursuant to Haw. Rev. Stat. § 174C-52. [KSBE FOF36]

37. On April 12, 1995, the **Interim Release** Agreement was extended until such time as the Commission could make a final decision on the Waiahole waters. [KSBE FOF37]

38. On April 18, 1995, the Commission conducted a public hearing pursuant to notice published in the Honolulu Star Bulletin to take public testimony on the WUPAs, the petitions to amend IIFS and the petitions for reservation of water. See Public Notice, dated March 2, 1995. Any person requesting a contested case did so orally or in writing at the public hearing. See Tr., Public Hearing, 4/18/95. All parties requesting standing in the contested **case hearing** filed a written application on forms provided by the Commission. Order Granting and Denying Applications to Participate in the Contested Case Hearing, 5/30/95. [WIC FOF83, KSBE FOF38]

### **4. Standing**

39. On May 17, 1995, the Commission held a hearing to determine which applicants for standing would be admitted as parties in the contested case. Order Granting and Denying Applications to Participate in the Contested Case Hearing, 5/30/95. [WIC FOF84, KSBE FOF39]

40. On May 30, 1995 the Commission filed its Order Granting and Denying Applications to Participate in the Combined **[Case]** Contested Case Hearing. The following were admitted as parties in the combined contested case hearing:

- a. Amfac JMB
- b. WIC
- c. Campbell Estate
- d. DLNR
- e. Robinson Estate
- f. Nihonkai
- g. Dole/C&C
- h. KSBE

- i. Del Monte
- j. Hawaii Farm Bureau
- k. OHA
- l. Kahaluu Neighborhood Board No. 29
- m. Waiahole-Waikane Community Association
- n. Hakipuu Ohana
- o. State Department of Agriculture ("DOA")
- p. DHHL
- q. City and County of Honolulu Planning Department ("C&C of Honolulu")
- r. City and County of Honolulu Board of Water Supply ("BWS")
- s. Department of the Navy ("Navy")
- t. Halekua Development Corp.
- u. Puu Makakilo
- v. West Beach Estates
- w. Hawaii's Thousand Friends
- x. Land Use Research Foundation ("LURF")

Order Granting and Denying Applications to Participate in the Combined Contested Case Hearing, dated May 30, 1995. [WIC FOF85, KSBE FOF40]

41. The parties who were denied standing included:

- a. Waipahu Neighborhood Board
- b. Hawaii Laieikawai
- c. Waipahu Business Association
- d. Waipahu Community Association
- e. Ewa Neighborhood Board
- f. Steve Kubota
- g. 13 current and past elected officials from Central and Leeward Oahu, including:
  - (1) Annelle Amaral
  - (2) Paul Oshiro
  - (3) Merwyn Jones
  - (4) Brian Kanno
  - (5) Nestor Garcia
  - (6) Robert Bunda
  - (7) Arnold Morgado
  - (8) Calvin Kawamoto
  - (9) Michael Kahekina
  - (10) Samuel Lee
  - (11) Roy Takumi
  - (12) Marcus Oshiro
  - (13) Ronald Menor
- h. People Oppose Initiative
- i. Life of the Land
- j. **Ka Lahui Hawaii**

Order Granting and Denying Applications to Participate in the Combined Contested Case Hearing, dated May 30, 1995. [WIC FOF86, KSBE FOF41]

42. Although initially denied standing, Ka Lahui Hawaii was subsequently admitted as a party by Order dated July 13, 1995 following its Motion for Reconsideration. Order Granting Ka Lahui's Motion to Reconsider Standing in the Waiahole Ditch Contested Case Hearing, dated July 13, 1995. [WIC FOF87]

43. Halekua Development Corporation was pursuing water requests on behalf of itself, Royal Oahu Resort, Inc., Koei, Inc. and the DOA. On August 7, 1995, the Commission issued Order No. 6, approving Halekua Development Corporation's motion to withdraw its own water request and to redesignate Royal Oahu Resort, Inc., Koei, Inc. and the DOA to continue in their own names. Order Number 6: Orders Regarding Motions Heard on July 24 and 27, 1995. [WIC FOF88]

## **5. Existing Use Hearings**

44. On June 13, 29, 30 and July 24, 1995, the Commission held hearings to determine those existing uses of windward groundwater allowed to continue under Haw. Rev. Stat. § 174C-48(a). "Existing uses" of windward groundwater were deemed to be those uses in place as of July 15, 1992, which is the effective date of designation of windward Oahu as a groundwater management area. Order Regarding Hearings on "Existing Uses" Under HRS § 174C-48(a), dated 6/20/95. [WIC FOF89, KSBE FOF42]

## **6. Existing Use Order**

45. On August 15, 1995, the Commission issued Order Number 8: Interim Order Identifying "Existing Uses" Allowed to Continue Under H.R.S. § 174C-48(a), which identified the parties with existing uses and allocated water to some of the parties for their interim use. On October 16, 1995, the Commission issued Order No. 10, clarifying certain aspects of Order No. 8.

Among other things, the Commission ruled in Order Number 8, as modified by Order No. 10, that:

a. The following parties established the following uses existing as of July 15, 1992:

(1)	Robinson Estate:	11.62 mgd
(2)	Campbell Estate:	11.00 mgd
(3)	Dole/C&C:	1.40 mgd
(4)	DLNR (Waiawa Prison)	0.12 mgd
(5)	Dole/C&C (Mililani Memorial Park)	0.14 mgd
(6)	Dole/C&C (Mililani Golf Course)	0.16 mgd
(7)	Royal Oahu	0.0048 mgd

b. The existing uses identified in (a) above were adjusted to reflect the following uses allowed to continue on June 30, 1995, as adjusted for near term needs through October 1, 1995.

(1)	Robinson Estate	3.483 mgd
(2)	Campbell Estate	4.062 mgd
(3)	Dole/C&C	1.40 mgd
(4)	DLNR (Waiawa Prison)	0.12 mgd
(5)	Dole/C&C (Mililani Memorial Park)	0.14 mgd
(6)	Dole/C&C (Mililani Golf Course)	0.16 mgd
(7)	Royal Oahu	0.0048 mgd

c. Nihonkai established an existing use as of July 15, 1992.

d. The Commission found that the following parties did not establish existing uses: Navy, Puu Makakilo, Halekua Development Corporation, State Agriculture Park (Kunia), Koei Hawaii, Inc. and West Beach Estates.

e. Measured at the North Portal, the average annual flow allowed to continue was 9.3698 mgd until further order of the Commission.

f. Order 8 rendered the question regarding extension of the Interim Release Agreement moot. [WIC FOF90, KSBE FOF43 - 46,]

## **7. Proposed Order to Bifurcate**

46. On July 14, 1995, the Commission's staff submitted a Proposed Order to Bifurcate Water Use Permits for Pearl Harbor groundwater from the Contested Case Hearing ("Proposed Bifurcation Order"), which states among other things, that KSBE applied for a groundwater use permit for water underlying its lands at Waiawa in Central Oahu. The water underlying this area is part of the Waipahu-Waiawa aquifer system of the Pearl Harbor **aquifer** sector. It is within the groundwater management area designated by the Board of Land and Natural Resources ("BLNR") under Chapter 177, Haw. Rev. Stat. prior to the enactment of the 1987 Hawaii Water Code, Section 174C, HRS. [KSBE FOF49]

47. The Proposed Bifurcation Order further states that KSBE applied to use water which does not derive from the Windward groundwater management area and because any such applications may be considered separate and apart from the groundwater permits and instream flow considerations which are the subject of the Waiahole Combined Contested Case Hearing, water use permit applications for groundwater within the Pearl Harbor management area should be bifurcated from these proceedings and perceived independently under the Water Code, Chapter 174C, HRS. [KSBE FOF50]

48. On August 7, 1995, the Commission by Order No. 6 denied the Commission staff's Proposed Bifurcation Order on the basis that the interrelated nature of competing claims mitigates in favor of continuing the combined process. [KSBE FOF51]

## **8. Filing of Testimonies and Motions**

49. All parties were required to submit their written direct testimony and witness lists by September 18, 1995; written rebuttal testimonies and witness lists by October 16, 1995; and written surrebuttal testimonies by October 30, 1995. Written opening arguments, exhibits and exhibit lists were required to be submitted to the Commission by November 3, 1995. See Minute Order Number 19, dated August 23, 1995. [WIC FOF91, KSBE FOF52]

50. On October 27, 1995, KSBE filed a "Motion for Declaratory Order Confirming Kamehameha Schools/Bishop Estate's Rights to Undiminished Use of All of the Water Emanating from that portion of the Waiahole Ditch Traversing Its Lands in Waiawa" ("Motion for Declaratory Order"). [KSBE FOF53]

51. On November 3, 1995, all parties and intervenors filed their Prehearing Briefs. [KSBE FOF55]

52. On November 3, 1995, opposition memoranda to KSBE's Motion for Declaratory Order were filed by the State Department of Land and Natural Resources and the Department of Agriculture, the Department of Navy, Waiahole-Waikane Community Association, Hakipu'u Ohana, Kahaluu Neighborhood Board, Ka Lahui Hawaii, and Hawaii Thousand Friends. [KSBE FOF54]

53. On December 13, 1995, the Commission issued Order No. 24 which denied KSBE's Motion for Declaratory Order. The Commission cited Order No. 18 in support of its decision by stating that "the Commission does not favor motions for declaratory orders prior to the presentation of the evidence on ultimate issues of law **[in] and** fact which **[is] are** so closely intertwined in these proceedings." [KSBE FOF57]

## **9. Commencement of Contested Case Hearing**

54. On November **[7] 9**, 1995, the Contested Case Hearing commenced. Entering appearances were the following:

- a. Alan M. Oshima, Esq. and Yvonne I. Izu, Esq. on behalf of Amfac/JMB Hawaii/Waiahole Irrigation Company, Limited;
- b. Michael W. Gibson, Esq. and Douglas S. Appleton, Esq. on behalf of the Estate of James Campbell;



- c. Stephen K. C. Mau, Esq. and Cheryl A. Nakamura, Esq. on behalf of the Robinson Estate;
- d. Gary M. Slovin, Esq. and Karen L.S. Stanitz, Esq. on behalf of Dole/Castle & Cooke;
- e. Benjamin A. Kudo, Esq., R. Brian Tsujimura, Esq., Nathan T.K. Aipa, Esq., and Kris N. Nakagawa, Esq. on behalf of Kamehameha Schools Bernice Pauahi Bishop Estate;
- f. Rick J. Eichor, Esq. and Rodney J. Tam, Esq. on behalf of State of Hawaii Department of Land and Natural Resources and Department of Agriculture;
- g. Ronald R. Sakamoto, Esq. and Carolyn E. Hayashi, Esq. on behalf of Royal Oahu Resort Golf Course;
- h. Nathan T. Natori, Esq. on behalf of Nihonkai Lease Co., Ltd.;
- i. Gilbert D. Butson, Esq. on behalf of Pu‘u Makakilo, Inc.;
- j. Jan N. Sullivan, Esq. and Don S. Kitaoka, Esq. on behalf of West Beach Estates;
- k. Matsumoto La Fountaine & Chow on behalf of Hawaii Farm Bureau Federation;
- l. Paul M. Sullivan, Esq. and Cheryl L. Connett, Esq. on behalf of the Department of the Navy;
- m. Dan Davidson, Esq. on behalf of Land Use Research Foundation;
- n. Clarence A. Paccaro, Esq., Randall K. Ishikawa, Esq., T. Lowell Wolf, Esq. and Mark K. Morita, Esq. on behalf of the City and County of Honolulu;
- o. Paul H. Achitoff, Esq., Lea O. Hong, Esq., Alan T. Murakami, Esq., Paul F.N. Lucas, Esq. and Carl C. Christiansen, Esq. on behalf of Waiahole-Waikane Community Association, Hakipuu Ohana, Kahaluu Neighborhood Board No. 29 and Ka Lahui Hawaii;
- p. Walter M. Heen, Esq., Elizabeth A.H. Martin, Esq. and Moses K.N. Haia, III, Esq. on behalf of the Office of Hawaiian Affairs;
- q. Clayton Lee Crowell, Esq. on behalf of the Department of Hawaiian Home Lands; and
- r. James T. Paul, Esq. on behalf of Hawaii's Thousand Friends. [WIC FOF92,

55. The opening statements and presentation of evidence by the parties began on November 9, 1995, and continued to August 21, 1996, during which there were fifty-two hearing days including four evening sessions. [CWRM FOF5]

#### **10. Closing Oral Arguments**

56. Parties and intervenors presented their closing oral arguments from September 18 to 20, 1996. [CWRM FOF6]

### **B. Interim Instream Flow Standard Amendment**

Section B contains the findings of fact concerning the proposed Interim Instream Flow Standard (IIFS) amendment and the effect of the partial restoration of flows to windward Oahu streams and to Kaneohe Bay.

The IIFS for the windward Oahu streams affected by the Waiahole Ditch system took effect on May 4, 1992. In effect, the amount of water flowing in the streams on May 4, 1992 cannot be changed without authorization from the Commission. Following OSCO's announced closure in August 1993, WWCA and the Office of Hawaiian Affairs (OHA) petitioned to amend the IIFS in December 1993 and February 1995, respectively. In response to complaints that OSCO was wasting water following its closure of cane operations, the parties participated in mediation which resulted in the "Interim Release Agreement" of December 1994 by which the Commission authorized WIC to provide a constant flow of about 8 mgd to Leeward Oahu and to release the unused flows into windward streams.

Testimony indicated that partial restoration of Waiahole Stream since December 1994, and of Waianu Stream since around June 1995, has had a positive effect on the native fish species in those streams. Although there was no evidence presented as to the extent of the native fish species in the streams prior to the construction of the Waiahole Ditch system, and although there was general agreement that there is insufficient knowledge of the ecosystem to define the quantitative population improvements resulting from stream flow restoration, in general, it is expected that additional flows to the streams would increase the native biota habitat.

Testimony on the effects of increased stream flows to Kaneohe Bay was mixed. On the positive side, there was testimony that there may be a direct relationship between higher fresh water flows and estuarine productivity. Others testified that reintroducing water from the Waiahole Ditch system is not a panacea for remedying the destruction that has occurred to Kaneohe Bay and its fisheries. There has been a dramatic decline in fish and limu in Kaneohe Bay since 1960. Factors contributing to the decline are urbanization, over-fishing, poaching, pollution, sediment run-off, dredging, sewage spills, algae blooms, growth of mangrove, development of culverts, and habitat degradation. The synergism of these factors is worse than the effects of

any single factor. Although decrease in stream flow may have been a factor affecting fish populations in Kaneohe Bay, scientists are unable to quantify the correlation between stream flow and improved fish habitat.

### **1. Interim Instream Flow Standard**

57. On April 19, 1989, the Commission set an Interim Instream Flow Standard ("IIFS") for all Windward streams (effective May 4, 1992) as the "amount of water flowing in each stream on the effective date of this standard." Such flow standards included all uses in existence as of May 4, 1992. [KSBE FOF26, WIC FOF61]

### **2. Petitions to Amend the Interim Instream Flow Standard**

58. On December 7, 1993, the Waiahole-Waikane Community Association ("WWCA"), Hakipu'u Ohana ("Ohana"), and the Kahalu'u Neighborhood Board ("KNB") petitioned the Commission to amend the interim instream flow standards for windward Oahu streams affected by the Waiahole Ditch systems. [KSBE FOF27, WIC FOF62]

59. On February 28, 1995, the Office of Hawaiian Affairs ("OHA") petitioned to amend the interim instream flow standard for Windward stream flow restoration for existing and new agriculture including taro cultivation; fishing; community based economic development; traditional and customary native Hawaiian practices and ecosystem restoration. [KSBE FOF28, WIC FOF63]

60. WWCA and OHA petitioned for an amendment to the **interim** instream flow standard, not for a permanent instream flow standard. WWCA Petition to Amend IIFS; OHA Petition to Amend IIFS. [WIC FOF64]

### **3. Stream Ecology - General**

61. **[Monthly] Since partial restoration in December 1994, monthly** monitoring of 'o'opu in Waiāhole is showing a general upward trend. Ronald Englund, February 28, 1996, p. 47, ll. 11-12. [WWCA FOF303]

62. A positive effect has been observed from the partial restoration of Waiāhole Stream. Ronald Englund, February 27, 1996, p. 134, ll. 3-6. [WWCA FOF304]

63. The partial stream restoration in December 1994 improved the stream habitat by sweeping out exotic fish that harbor parasites that are transmitted to native species, compete with native species for food and space, and interfere with spawning rituals. William Devick, February 13, 1996, p. 121, ll. 14-25; p. 122, ll. 1-18. [WWCA FOF305]

64. Prior to the partial restoration, both Waiāhole and Waianu streams were very similar, in that they were both very shallow, had weak currents, and had large exotic

populations. William Font, January 11, 1996, p. 123, ll. 7-12. [WWCA FOF313]

65. Immediately after the partial restoration occurred in Waiāhole Stream, an immediate and dramatic reduction in the exotics in Waiāhole Stream in comparison to Waianu Stream, which was not restored until about June 1995, was observed for a period of several weeks. William Font, January 11, 1996, p. 123, ll. 14-19. [WWCA FOF314]

66. It is not necessary to eliminate all exotics from the streams before there will be a positive effect on the native species. The more flow is restored, the more the exotics will be forced into refuges at the stream edges, with limited contact with the 'o'opu. Parasites may continue to exist in the stream, but at low enough levels that they will not **[causing] cause** any disease problem. William Font, January 11, 1996, p. 144, l. 25; p. 145, l. 1. [WWCA FOF316]

67. Aquatic experts have insufficient knowledge of the ecosystem context for native Hawaiian fish species to define **[and quantify]** the quantitative population improvements resulting from stream flow restoration. Devick, Tr., 2/13/96, P133/L16 to P134/L3, P147-49. [WIC FOF250]

68. No data is currently available to tell what flow characteristics are necessary to promote larval fishes from the ocean into freshwater streams and what current velocities are necessary to limit or prevent the occurrence of exotic fishes in such streams. (Fitzsimons Tr. 01/11/96 at 45, lines 24-25; at 46, lines 1-7). [KSBE FOF1318]

69. No one in the scientific community can conclusively state the amount of water that is necessary to positively impact 'o'opu recruitment. (Fitzsimons Tr. 01/11/96 at 64, lines 11-16). [KSBE FOF1319]

70. At the time of the survey, July 6, 1995, water had been returned to Waiahole Stream for about six (6) months and to Waianu Stream for about one (1) month, the habitat showed excellent potential for the re-establishment of native populations of 'o'opu, 'opai and hihiwai. Adult and juvenile 'o'opu nakea and 'o'opu naniha were observed. Juvenile 'o'opu nopili was also observed. The observance of these juveniles or post-larval fish species are an indication that these species are recruiting or returning from the ocean to the stream. (Brasher Tr. 04/23/96 at 21, lines 7-18). [KSBE FOF1328]

71. The additional flow to Waiahole-Waikane **[or] and** Waianu Streams is expected to benefit native Hawaiian 'o'opu species. Stream flow increases also enhance native biota habitat quality in several ways. First, increase in streamflow would increase the amount of deep water habitat which is preferred by native biota species like 'o'opu, nakea and 'o'opu alamo'o. Second, increased flow would also increase the amount of high velocity riffle habitat that 'o'opu alamo'o prefer. Finally, increased flow would increase habitat quality by magnifying the freshwater

signature in the estuaries thereby increasing the recruitment of ‘*o‘opu*. (Englund Tr. 12/14/95 at 20, lines 17-25; at 21, lines 1-25; at 22, lines 1-19). [KSBE FOF1329]

72. Prior to such flow decreases (**2 mgd to Waianu Stream**) in May 1995, much of Waiahole Stream above 200 feet consisted of very high velocity riffles. In September 1995, the flow in the upper Waiahole Stream area still appeared to exceed natural base flow. Above 500 feet, the Waiahole Stream could have been best described as torrential. The high discharge has probably been detrimental in the short-term to some native insect species, and much of the upper reaches of the stream do not provide good habitat for the native ‘*o‘opu* species. (Englund Tr. 12/13/95 at 217, lines 11-16). [KSBE FOF1409]

73. No evidence was presented as to the extent of native species inhabiting Waiahole Stream prior to the construction of the Waiahole Ditch in 1916. Fitzsimons, Tr., 1/11/96, P70/L5-12; Devick, Tr., 2/13/96, 133/23-25, 134/1-3. [WIC FOF233]

#### **4. Native Hawaiian Fish Species (‘*O‘opu*)**

74. ‘*O‘opu* or gobies are found throughout the world[.]. [**primarily**]**Primarily**, this fish species is found throughout the tropical areas such as in Costa Rica, Puerto Rico and Palau. (Englund Tr. 02/27/96 at 138, lines 22-25; at 139, lines 1-18). [KSBE FOF1296]

75. There are only five (5) native Hawaiian freshwater fishes in the Hawaiian islands. These are the gobies or ‘*o‘opu* species which are all amphidromous. Amphidromous means [**that the**] **two migrations**. **The** adult fish species spend their entire lives in fresh water. As such, the five (5) native ‘*o‘opu* species leave their eggs in fresh water and these eggs hatch within twenty-four (24) hours. (Fitzsimons Tr. 01/11/96 at 11, lines 20-25; at 12, lines 1-15). [KSBE FOF1297]

76. After the ‘*o‘opu* eggs hatch, the larvae which is about a millimeter and a half in size, are then washed out into the ocean. The larvae remains in the ocean from anywhere between four (4) to six (6) months before moving back up into the freshwater streams. (Fitzsimons Tr. 01/11/96 at 12, lines 16-25). [KSBE FOF1298]

77. Since the native ‘*o‘opu* species is amphidromous, the ‘*o‘opu* larvae must drift out to sea and spend several months in the ocean. Consequently, if such larvae is diverted into the taro *lo‘i*, it would not be able to survive if it does not eventually find its way to the ocean. (Devick Tr. 02/13/96 at 138, lines 1-25; at 139, lines 1-12). [KSBE FOF1299]

78. In comparing recruitment numbers between Waiahole and Waikane Streams, the substantial difference in recruitment occurs mainly with the ‘*o‘opu nakea* species and not so much with the other ‘*o‘opu* species such as the ‘*o‘opu nopili* and the *Lentipes concolor*. (Devick Tr. 02/13/96 at 141, lines 1-11). Of the five (5) native

'o'opu species, three (3) of the species, *Lentipes*, *nopili* and the *nakea*, are upstream or climbers of the streams. The other two (2) 'o'opu species are not climbers. (Devick Tr. 02/13/96 at 147, lines 14-16). [KSBE FOF1300]

79. Stock enhancement of native Hawaiian 'o'opu species has future potential. DLNR/DAR currently has a project that is attempting to produce hatchery-bred native 'o'opu species or gobiids. (Devick Tr. 02/13/96 at 160, lines 1-25; at 161, lines 1-9). [KSBE FOF1301]

80. Two (2) native Hawaiian 'o'opu species, 'o'opu akupa (*eleotris sandwicensis*) and 'o'opu naniha (*stenogobius hawaiiensis*) are usually restricted to the lower parts of the freshwater streams. The 'o'opu akupa does not have the fused, sucking pelvic fin. Although the 'o'opu naniha does have such fin, it is a weak[ly] muscle which is used more in elaborate courtship displays. **[Because these] These** two (2) 'o'opu species are usually found in the lower reaches of the streams[,]; they usually would not be found farther than the first waterfall. (Fitzsimons Tr. 01/11/96 at 13, lines 8-25). [KSBE FOF1302]

81. The 'o'opu *nopili* (*sicyopterus stimpsoni*) is another native Hawaiian 'o'opu species which is very unique among the Hawaiian freshwater fishes because it is the only species that feed on vegetation. In other words, the 'o'opu *nopili* are obligate herbivores. Unlike the native Hawaiian 'o'opu species which will take in vegetable material incidentally along with their carnivores habits, the 'o'opu *nopili* is the only species which survives strictly on algae or *limu*, and predominantly on diatoms. (Fitzsimons Tr. 01/11/96 at 14, lines 1-16). [KSBE FOF1303]

82. The 'o'opu *nakea* (*awaous guamensis*) is considered a favorite food and a sport fish. The 'o'opu *nakea* is probably the only species of native Hawaiian freshwater fishes that have a somewhat discreet spawning season. Unlike other native Hawaiian fish species which breed all year round, the 'o'opu *nakea*, as judged from the amount of courtship behavior, breeds most intensively during the summer months of June and July. (Fitzsimons Tr. 01/11/96 at 15, lines 3-25; at 16, lines 1-9). [KSBE FOF1304]

83. The 'o'opu *nopili* and the 'o'opu *nakea* are native Hawaiian fish species which reside in the middle reaches of the freshwater streams. The 'o'opu *nopili* are found in the swiftest part of the streams where there is a fairly shallow ripple zone and a good strong current coming over the area. On the other hand, the 'o'opu *nakea* are usually found a little further down the main channel stream in pockets where there is a little bit less current. (Fitzsimons Tr. 01/11/96 at 16, lines 11-19). [KSBE FOF1305]

84. Finally, the 'o'opu *alamo'o* (*Lentipes concolor*) are usually found further inland above the higher waterfalls. Although the 'o'opu *alamo'o* is a Category One candidate for being listed as endangered, **Fitzsimons testified that** the U. S. Fish and

Wildlife Service has unofficially stated that such native Hawaiian fish species is not in imminent danger. (Fitzsimons Tr. 01/11/96 at 16, lines 21-25; at 17, lines 1-18). [KSBE FOF1306]

85. The ‘*o‘opu alamo‘o* is a native Hawaiian fish species that has the ability to climb waterfalls through the use of a fused pelvic fin that forms like a suction disc. (Fitzsimons Tr. 01/11/96 at 17, lines 24-25, at 18, lines 1-25) (Heacock Tr. 03/07/96 at 182, lines 1-8). [KSBE FOF1307]

86. Recruitment events of native Hawaiian fish species are tied very closely to freshets. During a typical Hawaiian rainy season, a repeated series of flash floods appear to impact recruitment by causing the onshore orientation and movement of young fish to enter and move up the freshwater streams. (Fitzsimons Tr. 01/11/96 at 22, lines 15-25; at 23, lines 1-6). [KSBE FOF1308]

87. Storm events or flash floods appear to attract young fish to the freshwater streams because it is hypothesized that these young fish can either detect the odor or taste the sediment flow or other fish. (Fitzsimons Tr. 01/11/96 at 23, lines 20-25; at 24, lines 1-19). [KSBE FOF1309]

88. After the interim release of freshwater in December 1994, there was some return of native Hawaiian fish species. However, **Fitzsimons testified that** there is no way of telling where these fish species came from. (Fitzsimons Tr. 01/11/96 at 35, lines 7-25; at 36, lines 1-16). [KSBE FOF1310]

89. From January to June of 1995, DAR biologists studied the Waiahole and Waikane Streams. **[In] Devick testified that in** Waiahole Stream, substantial new recruitment of all five (5) native ‘*o‘opu* species, along with the native shrimp were discovered. The recruitment was substantially higher in Waiahole than Waikane. (Devick Tr. 02/13/96 at 120, lines 3-14). [KSBE FOF1311]

90. These findings were significant because: 1) two (2) of the native Hawaiian ‘*o‘opu* species *Lentipes concolor* and *Sicyopterus stimpsoni* have not been found as adults in the stream in prior samples; 2) another ‘*o‘opu* species *Awaous guamensis* was only found occasionally as an adult; and, 3) all three (3) of the native Hawaiian ‘*o‘opu* species found require suitable upstream habitat conditions for growth and reproduction. (Devick Tr. 02/13/96 at 120, lines 15-21). [KSBE FOF1312]

91. The findings with regard to *Lentipes concolor* has an added significance because such ‘*o‘opu* species, until a few years ago, was thought to be extinct on Oahu. This species is still known to exist in only a few streams and was also the subject of a petition for statewide listing as a federal endangered species. (Devick Tr. 02/13/96 at 120, lines 22-25; at 121, line 1). [KSBE FOF1313]

92. Exotic fish introductions have many recognized detrimental effects on native fish populations through predation, competition for space and food, interference with

spawning rituals, and as reservoirs for diseases transmissible to the native fish species. (Devick Tr. 02/13/96 at 121, lines 23-25; at 122, lines 1-7). [KSBE FOF1314]

93. **[In] Kido testified that in** July 1995, Waikane Stream actually had more ‘*o‘opu* than Waiahole Stream, even though Waikane Stream did not have any additional releases of water from the ditch. (Kido Tr. 04/17/96 at 52, lines 20-25; at 53, lines 1-2). [KSBE FOF1315]

94. The native Hawaiian ‘*o‘opu* species is important to traditional and customary native Hawaiian gathering practices. (Devick Tr. 02/13/96 at 185, lines 9-13). [KSBE FOF1317]

95. In determining the amount of native fish species in any given stream, the key is to follow a standardized methodology or approach that determines trends of native fish species rather than the discreet or specific amounts of native fish species. (Fitzsimons Tr. 01/11/96 at 65, lines 5-25). [KSBE FOF1320]

96. There are streams which are very small naturally that have low flow, but are permanently occupied by native fish species. For example, on Maui, there are streams with low flow that do contain mostly native fishes and a good native fish habitat. (Hodges Tr. 4/16/96 at 174, lines 13-18). [KSBE FOF1321]

97. There are certain types of algae that would support fish life in the streams. If there is more water, then there would probably be more algae and more fish would be recruited to the stream. (Kido Tr. 02/21/96 at 132, lines 15-25). In other words, to increase the flow in Waiahole, you also increase the wettable habitat and will have a greater abundance of algae. The increase in algae in turn will also probably increase the probability of fish life in the stream. (Kido Tr. 02/21/96 at 133, lines 1-11). [KSBE FOF1322]

98. Algae growth or the benthos of the stream is an added component to determine the availability of foods in the stream. In other words, the study of benthos in a stream determines how good the habitat is for ‘*o‘opu* or other insects either eating the algae or using the algae for reproduction. (Kido Tr. 02/21/96 at 152, lines 16-25; at 153, lines 1-11). [KSBE FOF1323]

99. In the streams or rivers, the ‘*o‘opu* often guard tenaciously their egg nests. As a result, these ‘*o‘opu* fish species are very vulnerable when they are speared by fisherman. Spear fisherman often disturb the substrate of the egg nest and the eggs themselves. Consequently, spearfishing, although common, is much more damaging to the stream ecology than are other fishing techniques such as pole fishing. (Heacock Tr. 03/07/96 at 184, lines 1-21). [KSBE FOF1324]

100. Habitat loss in the streams could be caused by increased sediment build up on the substrate. If you increase the sediment loads in the stream, the benthic algae



communities will also be negatively affected. Consequently, sediment loads may be one of the major problems of habitat degradation. (Heacock Tr. 03/07/96 at 209, lines 3-25; at 210, lines 1-25; at 211, lines 1-6). [KSBE FOF1325]

101. [The] **Fitzsimons testified that the** native 'o'opu species on Oahu are not distinct from the native 'o'opu species on the islands of Kauai, Hawaii and Maui. Because of the offshore larval stage process of the native 'o'opu species, there is enough transport of these larval 'o'opu between the islands that development of distinctions has not occurred. Therefore, native 'o'opu species can actually get transported from island to island. (Fitzsimons Tr. 01/11/96 at 82, lines 7-25). [KSBE 1327]

102. Little is [likewise] known about the relationships of flow to algal or invertebrate abundance. (Kido WRT 10/16/95 at 4, paragraph 2). [KSBE FOF1332]

103. 'O'opu larvae inevitably get caught in taro fields. In other words, there is some entrainment [of the] **due to** diversions like taro fields. Entrainment meaning that these species are swept into the fields and are prevented from returning to the river. (Kido Tr. 4/17/96 at 59, lines 16-25, at 60, lines 1-6). [KSBE FOF1333]

## **5. Alien/Introduced/Exotic Fish Species**

104. Exotic fish will continue to occur in Waiahole Stream regardless of how much water is returned. One can see that there are fewer exotics in Waiahole, but there were high levels of these exotic fishes in the backwater. So if these protected areas, or refuges persist, then the streams will continue to have exotics. (Font Tr. 1/11/96 at 128, lines 21-25). [KSBE FOF1357]

105. Prior to the restoration of flow to the Waiahole Stream in December of 1994, both the Waiahole and Waianu streams had high population densities of exotic or alien fish species. In January of 1995, after the restoration of flow, there was a reduction in the exotic or alien species in the Waiahole Stream. In May and June of 1995, approximately six (6) months after the restoration of flow, there continued to be a reduction in exotic fish in both Waianu and Waiahole Stream. (Font Tr. 01/11/96 at 123, lines 14-25; at 124, lines 1-20). [KSBE FOF1358]

106. Increasing stream flow or continuing stream flow is not necessary in order to remove exotic species from a stream as opposed to a flood event. Increasing stream flow will never eradicate alien species. However, it may lower their densities and abundances. To eradicate alien species from a river stream, the use of rotenone may be effective. (Heacock Tr. 03/07/96 at 219, lines 1-25). [KSBE FOF1361]

107. The alien or exotic fish species are a significant factor in contributing to the decline of the native 'o'opu. However, such alien species are not the only factor and is not the major cause in the decline of native fish species like [to] 'o'opu. (Hodges Tr. 4/16/96 at 171, lines 1-25; at 172, lines 1-23). [KSBE FOF1362]

108. Once exotic species are in the stream, it is almost impossible to remove them. One can only hope to control them by depressing their population. (Bovee Tr. 4/10/96 at 186, lines 7-9). [KSBE FOF1364]

109. In Hawaii, it will be difficult to rid streams of exotic species for two (2) reasons. One is the behavior of the stream; no matter how much flow is returned to the stream, there will always be little refuges that the exotics will discover and hide in. (Bovee Tr. 4/10/96 at 189, lines 1-7). A second reason is the behavior of the fish; during catastrophic events like flash floods, fish can actually burrow right down into the bottom and get out of the water column. (Bovee Tr. 4/10/96 at 189, lines 16-18). This is known to happen in Hawaii. The fish, perhaps realizing it would be futile to fight the current, get closer to the bottom of the stream where the current is slower. The fish eventually go down into the laminar zone between the cracks and the rocks. They remain there until the rocks move. (Bovee Tr. 4/10/96 at 190, lines 4-10). [KSBE FOF1366]

110. Periodic heavy rain flow or freshets in Waiahole Stream has not succeeded in eliminating exotic or alien species from the Waiahole Stream. Prior to December of 1994 when the Waiahole Stream was restored, no one knows whether the population of exotic fish was increasing or decreasing because there were no studies at that time. (Font Tr. 01/11/96 at 140, lines 6-25; at 141, lines 1-4). [KSBE FOF1363]

111. Waiahole and Waianu are two (2) streams that have exotic species in them. (Bovee Tr. 4/10/96 at 201, lines 16-20). However, there is no data to compare its present concentration with previous levels. Thus, the relative abundance of exotic species is unknown. (Bovee Tr. 4/10/96 line 201, lines 16-21). Further downstream there were more exotic species: gobies, 'opae, tilapia, and guppies. (Bovee Tr. 4/10/96 at 201, lines 23-25). Further upstream, however, these different species were notably absent. (Bovee Tr. 4/10/96 at 201, lines 1-2). [KSBE FOF1367]

112. After December 1994, monthly monitoring in the middle reaches of the Waiahole and Waianu streams has revealed no clear decrease in the abundance of introduced fish (*poecillids*) during this assessment. In contrast, *aholehole* abundance increased, accompanied by a slight decrease in introduced fish, in the lower portion of the Waiahole Stream. However, it is not conclusive whether these increases in the *aholehole* abundance are flow related or mini-seasonal fluctuations. (Englund Tr. 12/13/95 at 313, line 25 at 214, lines 1-8). [KSBE FOF1370]

113. Introduced or alien species flourish in taro fields because these fields provide a slow water velocity refuge for these introduced or alien fish species. (Englund Tr. 02/27/96 at 105, lines 18-21). [KSBE FOF1390]

## **6. Parasites**

114. Fourteen (14) species of parasites were found in native stream fishes. Of

these fourteen (14) species, only three (3) of these species are considered to be important in affecting the native 'o'opu. These three (3) species are pathogenic which means that they can produce disease in the native fish that they parasitize. (Font Tr. 01/11/96 at 114, lines 1-12). [KSBE FOF1335]

115. These three (3) species of parasites are: the roundworm (*nematode Camallanus cotti*); the tapeworm (*cestode Bothriocephalus acheilognathi*); and the leech (*Hirudinean Myzobdella lugubris*). These three (3) parasites have been introduced into the stream by alien or exotic fishes such as swordtails, guppies, and mollies. (Font Tr. 01/11/96 at 114, lines 13-25; at 115, lines 1-2). These alien or exotic species were introduced to Hawaiian streams for purposes of mosquito control. Subsequently, the widespread introduction of these alien or exotic species had been associated with aquarium releases. As a result, these alien or exotic fishes are now in many of the Hawaiian streams. (Font Tr. 01/11/96 at 115, lines 3-6). [KSBE FOF1336]

116. The roundworm, a native of the Orient, is a very common parasite in many freshwater fishes in the Orient. It is also found in Europe and the United States, including Hawaii. The roundworm has a two-host life cycle, using copepods and intermediate hosts and fish as its final host. Copepods are tiny little crustacea and are relatives of the shrimp. (Font Tr. 01/11/96 at 115, lines 8-22). [KSBE FOF1337]

117. Copepods, the intermediate host, contain the young or juvenile stage of the roundworm. However, when fishes feed on these copepods, the young or juvenile roundworm is then transferred to the fish and it grows to a much larger parasite in the intestine of the fish. (Font Tr. 01/11/96 at 115, lines 16-25; at 116, lines 1-2). [KSBE FOF1338]

118. The tapeworm, known as the Asiatic fish tapeworm, is also a native of the Orient. Parasitologists regard this tapeworm as a most widely distributed parasite of fishes in the world. (Font Tr. 01/11/96 at 116, lines 3-10). [KSBE FOF1339]

119. The tapeworm has been shown to be a major disease producer in aquaculture situations, and it too has a two-host life cycle, using copepods as intermediate host. In other words, when the fish in the stream feed on the copepods, the fish acquire the young stage of the parasite, and then that parasite grows into a large tapeworm in the intestine of the fish. (Font Tr. 01/11/96 at 116, lines 11-17). [KSBE FOF1340]

120. Finally, the leech, which is probably introduced into Hawaii by the blue crabs, still involves an intermediate host in the stream. However, the leech can be transferred directly from one fish to another without such intermediate hosts. (Font Tr. 01/11/96 at 116, lines 19-25; at 117, lines 1-10). [KSBE FOF1341]

121. Because the intermediate host, copepods, do much better in slow-moving or

standing water because they are such weak swimmers, there is a strong connection with stream flow and parasite abundance. (Font Tr. 01/11/96 at 120, lines 1-10; at 121, lines 14-16). The heaviest infections of roundworms occurred in the smallest species of fish, namely the guppies, and also the smallest individuals of the largest species. The reason is because the smaller fish or a little juvenile fish is much more likely to feed heavily on copepods which are the intermediate host for these roundworms. (Font Tr. 01/11/96 at 122, lines 4-25; at 123, lines 1-5). As such, the smaller exotic or alien fish such as the guppies are the best final host for the parasites. (Font Tr. 01/11/96 at 123, lines 20-25; at 124, line 1). [KSBE FOF1342]

122. No one knows how much water is necessary to either reduce or eliminate parasites. (Font Tr. 01/11/96 at 144, lines 1-15). There are no conclusive studies that exotic fish are more susceptible to the parasites than the native fish and vice versa. Therefore, there is no conclusive evidence that the native fish species become more affected than the exotic fish species from eating the copepods. (Font Tr. 01/11/96 at 145, lines 19-25; at 146, lines 1-9). [KSBE FOF1343]

123. There is also no conclusive studies measuring or quantifying mortality rates of fish as a result of parasite infections. Therefore, the presence of exotic parasites in a fish does not imply that the population of such fish is going to be eliminated ultimately by the exotic parasites. (Font Tr. 01/11/96 at 147, lines 4-12; at 148, lines 21-25; at 149, lines 1-3). Based upon basic biology, parasites will not kill or eliminate their host. (Font Tr. 01/11/96 at 152, lines 22-25; at 153, lines 1-14). [KSBE FOF1344]

124. The '*o'opu nopili* is resistant to parasite diseases. Because the '*o'opu nopili* is unaffected by such disease, it is believed that the '*o'opu nopili* can co-exist with alien fish species such as the swordtails. (Kido Tr. 04/17/96 at 80, lines 1-12). [KSBE FOF1345]

125. The accumulation of detritus within a stream is not a healthy situation for the native stream life. (Kido Tr. 04/17/96 at 83, lines 1-9). [KSBE FOF1346]

126. The potential to produce morbidity and mortality (i.e. disease and death) in native fish is mainly associated with three (3) helminth parasites: the roundworm *Camallanus cotti*, the tapeworm *Bothriocephalus acheilognathi*, and the leech *Myzobdella lugubris*. (Font Exhibit N-19, at 5, paragraph 3). [KSBE FOF1347]

127. Fish become infected when they eat copepods that contain the juvenile roundworms. These small crustaceans are weak swimmers and are termed planktonic organisms (i.e. they are at the mercy of the currents). Their populations increase in conditions of standing water or very weak stream flow. Thus, copepod populations peak in naturally intermittent streams such Waiula'ula Gulch or diverted streams such as Waianu Stream. High copepod populations provide ideal conditions for the transmission of roundworms, explaining the high abundance of this parasite in streams with weak current. (Font Exhibit N-19, at 6-7). [KSBE FOF1348]

128. Comparison of the necropsy data from both native gobioid fishes and exotic *poecillid* fishes between Winter 1994-1995 and Summer 1995 indicates, however, that abundance levels of parasites (average number of parasites per fish) have not yet declined. (Font Exhibit N-19 at 17, paragraph 2). [KSBE FOF1349]

129. Furthermore, after six (6) months of restored flow, some recruitment of parasites into Waiahole Stream fishes was still occurring, as indicated by the occurrence of juvenile roundworms in fish intestines. (Font Exhibit N-19, at 17, paragraph 2). [KSBE FOF1350]

130. An important consideration is the fact that exotic fish populations remain very high elsewhere in the Waiahole watershed, notably in Waianu Stream. These parasites release their infected juvenile stages in Waianu Stream. The juvenile parasites subsequently flow downstream into Waiahole Stream. Therefore, infected *poecillids*, thriving in the weak current of Waianu Stream may continue to serve as sources of infections for native gobioids in Waiahole Stream. (Font Exhibit N-19, at 17, paragraph 2). [KSBE FOF1351]

131. What is important from the point of view of the intermediate host copepod, the stronger the flow, the tougher it is for the copepod to make a living. From the point of view of the exotic fishes, if the exotic fishes and the native fishes are not intermixed, then the likelihood of transference of parasites is decreased. (Font Tr. 1/11/96 at 143, lines 3-9). But the restoration of flow is not a panacea to completely eliminate parasites or to eliminate exotics. (Font Tr. 1/11/96 at 144, lines 17-19). [KSBE FOF1352]

132. In some cases, parasites do kill their host, whether that parasite is a worm, in this case, or bacteria or virus. (Font Tr. 1/11/96 at 153, lines 10-14). So there is a detriment to a fish from parasites in terms of its reproductive ability. If that occurs in guppies, then by extrapolation, we could predict that would occur in any fish, including 'o'opu. (Font Tr. 1/11/96 at 159, line 25, at 160, lines 1-3). [KSBE FOF1353]

## **7. Native Hawaiian Damselflies**

133. Many scientists are deeply concerned about the fate of the native Hawaiian *Megalagrion* damselfly species. Specifically, *Megalagrion leptodemas* and *Megalagrion oceanicum* are found only on the island of Oahu. (Englund Tr. 02/27/96 at 112, lines 22-25; at 113, lines 1-12). [KSBE FOF1266]

134. Three (3) Category One (candidate endangered) damselfly species were found in this assessment. The most common, *Megalagrion nigrohamatum nigrolineatum*, occurred in all drainages or streams except Waiahole and Hakipu'u streams. *Megalagrion oceanicum* was found in Kahaluu stream. *Megalagrion leptodemas* was found only at Waiawa Stream which is located on the Leeward side of Oahu. (Englund Tr. 12/13/95 at 213, lines 19-24). [KSBE FOF1268]

135. Two (2) native Hawaiian damselfly species, *Megalagrion leptodemas*, which is found in Waiawa Stream, and *Megalagrion nigrolineatum*, which is found in Waikane Stream, prefer very calm, slow water flow. These native damselfly species dislike fast riffing and torrential water. (Englund Tr. 02/28/96 at 12, lines 1-8). Therefore, from a biological perspective, adding more water to the streams is not necessarily better for all native Hawaiian stream species. (Englund Tr. 02/28/96 at 14, lines 1-10). [KSBE FOF1269]

136. Moreover, alien or introduced fish species such as swordtails and guppies prefer the same slow water habitat that the native Hawaiian damselfly species prefer. (Englund Tr. 02/28/96 at 14, lines 11-22). [KSBE FOF1272]

137. Increased flow in Waikane Stream would probably benefit most aquatic biota. However, the present low flow of regime in the upper Waikane Stream area appears to favor the persistence of *Megalagrion nigrohamatum nigrolineatum* and *Megalagrion hawaiiense* at high densities. Any sudden increase in base flow would likely alter the aquatic biota system and could prove deleterious to these insect species. (Englund Tr. 12/13/95 at 216, line 7-13). [KSBE FOF1273]

138. The adult native Hawaiian damselflies are fairly large insects comprising of approximately an inch to two (2) inches in length. The males defend territories, while the females lay eggs in aquatic vegetation. As such, the immature damselflies are aquatic, and they inhabit aquatic systems from perennial streams to intermittent streams that do not necessarily have to be flowing. (Asquith Tr. 03/16/96 at 154, lines 13-25; at 155, lines 1-7). [KSBE FOF1275]

139. There are over twenty-three (23) different species of native Hawaiian damselflies and these species have evolved to utilize different types of habitats. Over the past 100 years, there has been a marked decline in many of the species of native Hawaiian damselflies. The major threats of these species include development, water diversion, and the introduction of alien fish species. (Asquith Tr. 03/06/96 at 154, lines 17-25; at 156, lines 1-11). [KSBE FOF1276]

140. Unlike other native stream insects and aquatic organisms, most of the species of the native Hawaiian damselflies are restricted to a single island. On the island of Oahu, there are three (3) species that breed primarily or exclusively in streams: 1) the *Megalagrion oceanicum* (also known as the oceanic Hawaiian damselfly); 2) the *Megalagrion nigrolineatum* (also known as the black line damselfly); and, 3) the *Megalagrion leptodemus* (also known as the crimson Hawaiian damselfly). (Asquith Tr. 03/06/96 at 156, lines 12-25; at 157, lines 1-15; at 158, lines 1-3). These three (3) species are presently recognized by the U.S. Fish and Wildlife service and are Candidate One species for listing them as either threatened or endangered species. (Asquith Tr. 03/06/96 at 158, lines 8-14). [KSBE FOF1277]

141. The *Megalagrion oceanicum*, as adults, are typically seen along the wide open corridors of perennially flowing streams. As immatures, this species tend to be

found in the riffle or faster flowing sections of the streams. (Asquith Tr. 03/06/96 at 157, lines 9-14). [KSBE FOF1278]

142. The *Megalagrion nigrolineatum* is a stream breeder that breeds in both the faster flowing sections of the streams and also the small, quiet pools. (Asquith Tr. 03/06/96 at 157, lines 15-23). [KSBE FOF1279]

143. Finally, the *Megalagrion leptodemus* is a stream breeder and this species tends to breed only in the slower, quieter and still pools in intermittent streams or at the quiet sites seepage-fed side pools of flowing perennial streams. (Asquith Tr. 03/06/96 at 157, lines 25; at 158, lines 1-7). [KSBE FOF1280]

144. [To] Asquith believes that to conserve and recover the native Hawaiian damselfly species, there should be strong public education on the effects of the alien species; wise management of the physical habitat; and development of control measures for alien fish species. (Asquith Tr. 03/06/96 at 223, lines 23-25; at 224, lines 1-4). [KSBE FOF1293]

145. The native Hawaiian damselfly species is of scientific interest because of their evolution, ecology, and behavior. Specifically, the entire group of native Hawaiian damselflies are found nowhere else in the world except for Hawaii. (Asquith Tr. 03/06/96 at 226, lines 14-25; at 227, lines 1-25; at 228, lines 1-10). [KSBE FOF1294]

## **8. Floral/Plant**

146. The diversion of water by the Ditch along with other changes greatly disturbed the watershed ecosystem of Waiāhole-Waikane. Deiter Mueller-Dombois, March 7, 1996, p. 65, ll. 6-25. [WWCA FOF375]

147. Both factors (clearing for agricultural practices and lack of water) are responsible for the retraction of the forest in the Waikane area. But development is probably a more important factor than the Waiahole Ditch itself by drying up the slopes below. (Mueller-Dombois Tr. 3/17/96, p. 87, lines 3-11). [CWRM FOF7]

148. Even in undiverted streams, such as the Limahuli Stream, non-native plant species may cause a problem for the ecosystem within that undiverted stream. (Kido Tr. 04/17/96 at 62, lines 1-9). [KSBE 1398]

149. Vegetation can also have an effect on the amount of water in a stream over a period of time. For example, in Arizona, where salt cedar encroached on a river. The stream consequently narrowed almost ninety percent (90%), from being 300 feet in width to only thirty (30) feet in width. (Bovee Tr. 4/10/96 at 180, lines 15-25). [KSBE 1399]

150. If the 'o'opu larvae get washed into a taro lo'i, they will not survive. Unless

they were able to pass through within a very short period of time, they would be essentially lost. (Devick Tr. 1/13/96 at 138, lines 6-23). [KSBE FOF1400]

151. The Waiahole Ditch system crosses three (3) major gulches and associated streams on the Leeward side of the island. These are the Waiawa Gulch, Kipapa Gulch and Waikele Gulch. (Char Tr. 12/13/95, at 198, line 25, at 199, lines 1-2). The vegetation found within these three (3) gulches is composed primarily of introduced and alien species such as *koa-haole*, Guinea Grass and Java plum. (Exhibit J-7; Tr. 12/13/95, at 200, lines 1-3). Therefore, no threatened and endangered species of plants were reported or expected to be found in the gulches. (Exhibit J-7). [KSBE FOF1566]

152. Today, there is very little, if any, of the original native vegetation left. Almost all of the vegetation is secondary in nature, consisting of mixed secondary Java plum forest, grasslands, and cultivated lands. (Char Tr. 12/13/95 at 201, lines 1-5). Six (6) listed endangered species and seven (7) Category One candidate endangered species of plants were recorded from the Waiahole-Waikane area. However, the majority of the listed and proposed endangered plants are associated with the higher elevation Ko'olau summit and ridge areas. (Char Tr. 12/13/95 at 201, lines 22-25). No threatened or endangered species of plants or sensitive native plant dominated communities have been recorded in the lower sections below the ditch. (Char Tr. 12/13/95 at 202, lines 1-3). [KSBE FOF1568]

153. Based upon this botanical resources assessment, if the Waiahole Ditch water flowed exclusively either to the Leeward side or the Windward side or both sides, the flow would have no significant negative impact to any endangered species of plants, to any sensitive native plant communities or any critical habitats of plants because there are no threatened and endangered plants in the vicinity of the Waiahole Ditch system. (Char Tr. 12/13/95, at 202, lines 4-8). [KSBE FOF1569]

154. Broom sedge grass is an alien grass which may cause some watershed impairment such as erosion. For example, in 1967 to 1968, the rain forests on Oahu invaded by broom sedge grass showed soil water in excess of filled capacity, although rainfall did not appear to deviate from the norm. The transpiration, evaporation, penetration, and saturation deficit rates of the broom sedge grass were compared to other trees such as the java plum and mango. The results indicated that the transpiring rates of the other trees were three (3) to four (4) times greater than the broom sedge grass, and that the broom sedge recirculated only one-fourth (1/4th) of the incoming rainfall. Hence, the grass sod becomes waterlogged, often gets torn off, and begins to downslope, causing erosion. (Mueller-Dombois Tr. 9/15/95 at 10, lines 13-17). [KSBE FOF1570]

155. Therefore, broom sedge grass is a problem in the Waiahole-Waikane area, especially in the kula portions, although it was also located in other areas such as near Kailua Drive-In and in Pupukea. However, the problem can be controlled or minimized. For example, the Kailua Drive-In area has been eradicated by allowing



the area to naturally develop and keeping fire out; the broom sedge grass then disappears as a tree cap forms over the area or as larger trees inhabit the area. Moreover, in the kula portions of the Waikane side of the valley, broom sedge grass primarily grows in the abandoned fields where pineapple and sugarcane were formerly farmed. There is also more development and less broom sedge grass around the Waiahole Stream. (Mueller-Dombois Tr. 3/7/96 at 77, lines 9-25; at 78, 17-25; at 79, lines 1-21; at 80, lines 1-21). [KSBE FOF1571]

156. The rain forest has diminished in the Waiahole-Waikane Valley by about 1,000 meters up to where the ditch is located. One of the possible causes for the retraction of the rain forest cover in Waikane could be due to the pineapple and sugarcane or other activities in the kula area actively removing trees or vegetation. (Mueller-Dombois Tr. 3/7/96 at 85, lines 16-22; at 86, lines 17-23). [KSBE FOF1572]

157. In terms of restoring the rain forest, the first step would be to replant the tree species. However, while the rainfall precipitation in the watershed might be sufficient to nourish the replanted trees, additional irrigation in periods of dry spells might actually be necessary in the beginning. (Mueller-Dombois Tr. 3/7/96 at 96, lines 22-25; at 97, lines 1-17). [KSBE FOF1573]

158. On the contrary, the amount of surface visible water in the area appears less today than it was even twenty (20) to thirty (30) years ago. This could be because some trees, like the eucalyptus, metrosideros and *'ohi'a-lehua*, are water-thirsty and actually use and retain a lot of water instead of recycling the water back into the atmosphere through transpiration. (Mueller-Dombois Tr. 3/7/96 at 88, lines 5-6, 17-24; at 89, lines 8-12; at 90, lines 1-25; at 91, lines 1-9; at 93, lines 1-25; WDT 9/15/95 at 15-17). [KSBE FOF1574]

159. Also, in the 1950s and 1960s, it was the responsibility of the taro farmers and some truck farmers that used the *'auwai* for their farm to maintain the *'auwai* that passed through Waiahole school and to maintain the diversions to get the water into the *'auwais*. Since then, there has been no attempt to clean the *'auwai* system makai or to divert water into those *'auwais*. (Fernandez Tr. 4/10/96 at 81, lines 3-18). [KSBE FOF1575]

160. **[In] Fernandez testified that in** the 1950s and 1960s, there was less vegetation growing in and around the Waiahole stream **[when he was young]**. For example, there were no albezia trees there, and the hau bushes were much less dense before, especially on his property that he maintained. (Fernandez Tr. 4/10/96 at 85, lines 7-22). This is because the farmers used to maintain the bushes, including the hau bush and even the river because they used the river for irrigation purposes. Now, there are less farmers maintaining the area which means increased vegetation along the stream. Therefore, the increase in vegetation may be one of the reasons contributing to the change in stream flow. (Fernandez Tr. 4/10/96 at 86, lines 21-25; at 87, lines 1-7; at 88, lines 1-25; at 89, lines 1-20). [KSBE FOF1576]

161. The exotic plants that fill Waipio Valley consume devastatingly large amounts of water. The valley is not as clean of these creatures as the farmers would like or need it to be. Therefore, when the *loʻis* are opened up, the exotics are the first things to get eradicated. (N. Kahakalau Tr. 4/11/96 at 35, lines 14-19; at 36, lines 21-24). [KSBE FOF1577]

## **9. Stream Restoration**

162. According to the American Fishery Society, the definition of "stream habitat restoration" is the return of an ecosystem to a close approximation of its condition prior to disturbance, which includes human disturbance. (Englund Tr. 02/28/96 at 32, lines 8-25). [KSBE FOF1401]

163. All drainages and streams assessed were dominated by introduced species, particularly at low elevations. Native species such as the *ʻoʻopu alamoʻo* (*Lentipes concolor*) [was] **were** found in three (3) Windward stream systems. The native mollusk, *Hapawai* (*Neritina vespertina*) was found in the Waiahole Stream. (Englund Tr. 12/13/95 at 213, lines 14-18). [KSBE FOF1402]

164. Hawaiian streams are algal based, which means that algae is the primary source of energy into streams. All of the fish species including *ʻoʻopu* feed on algae. (Kido Tr. 04/17/96 at 9, lines 10-13). [KSBE FOF1405]

165. In the lower parts of Waiahole Stream that was sampled, there were two (2) kinds of algae present: the swift water algae, which is called cladophora; and the slow water algae, which is called ulothrix. Cladophora is found in all streams throughout the state and is liked by the stream fishes. On the other hand, ulothrix is not known to be liked by any of the stream fishes. (Kido Tr. 04/17/96 at 10, lines 1-25; at 11, lines 1-6). [KSBE FOF1406]

166. Independent of stream flow, agriculture activities that adjoin the stream affect the sediment load and perhaps even the benthic algae. (Kido Tr. 04/17/96 at 35, lines 24-25; at 36, lines 1-5). [KSBE FOF1407]

167. Scientists currently are not able to predict what the exact velocity, amount of daily discharge, or annual flow the native stream species require to maintain viable populations. Therefore, to adequately evaluate any impacts on a change in flow regime, the study would need to be conducted over an extended period of time, starting with at least two (2) to three (3) years. (Brasher Tr. 02/21/96 at 65, lines 3-22). To determine a minimum flow level to maintain the viability of our natural native stream organisms would require combining hydrology studies with biology studies. (Brasher Tr. 02/21/96 at 72, lines 5-17). [KSBE FOF1411]

168. Restoring the streams back to the precontact or pre-Ditch days would be very difficult because the riparian vegetation has completely changed over the years. Also, in streams such as Waiahole, the traditional or historic amount of discharge is

unknown. (Brasher Tr. 02/21/96 at 75, lines 16-25; at 76, lines 1-12). [KSBE FOF1412]

169. In restoring Hawaiian ecosystems, it would be difficult to get rid of all of the **[introduced]** species introduced in the streams. Therefore, the objective is to bring these streams or ecosystems back to a place where they can support native organisms. In other words, stream restoration is bringing back the native organism populations so that they are viable and they can live, grow, reproduce, and have future generations in the stream area. (Brasher Tr. 02/21/96 at 76, lines 13-22). [KSBE FOF1413]

170. The restoration of a stream is not only limited to the quantity or the velocity of the water in the stream, but it also involves the vegetation around the stream, the uses around the stream and, probably, even how the stream water is diverted. (Kido Tr. 02/21/96 at 146, lines 10-25; at 149, lines 1-15). [KSBE FOF1415]

171. Although the restoration of flow will reduce the ability of the alien fish species to survive, such restoration does not necessarily mean that it will solve all of the problems. (Hodges Tr. 2/21/96 at 177, lines 13-16). [KSBE FOF1418]

172. A more suitable restoration of Windward streams would involve the partitioning of flow among a number of stream systems such as the Kahana Stream, the Waikane Stream, the Waianu Stream and the Waiahole Stream, from which the flow was originally diverted in restoring streams and seeps that feed these streams before the disruption of the aquifer. (Englund Tr. 02/27/96 at 131, lines 4-8). [KSBE FOF1422]

173. Shortly after the flow restoration, DLNR staff biologists visited the upper reach of Waiahole and judged the flow conditions to be too swift to provide goby habitat. (Devick WDT 9/18/96 at 11). [KSBE FOF1424]

174. Restoration can take many forms, such as removal of a drainage pipe, replanting of riparian vegetation, removal of man-made alterations and the control or eradication of exotic species. Even small flow increases should be viewed as beneficial to the native biota because those incremental improvements could not only become substantial with time but we could also improve our knowledge base during the entire period, if appropriate simultaneous studies were undertaken. (Devick WDT 9/18/95, at 12). [KSBE FOF1426]

175. **[DLNR] The Division of Aquatic Resources (DAR)** recommended that higher flows should be introduced in stages rather than suddenly restoring the total original base flow. (Devick Tr. **[1/13/96] 2/13/96** at 118, lines 10-15). [KSBE FOF1427]

176. Flow restoration alone will probably not lead to recovery of native organisms. Additional action may be necessary to augment population recovery. Netting or

trapping may be employed to reduce the presence of alien species during initial stages of recovery. Also, because stream populations may be self-recruiting it may be necessary to stock the restored streams with adult macrofauna to enhance population recovery rates (Hodges Exhibit M-17B, at 12). Therefore, some direct management of alien species may be necessary to augment native stream animal population recovery (Hodges Exhibit M-18, at 3, final paragraph). For example, because of the nature of the metapopulation structure of hihiwai statewide, it may prove necessary to assist the recolonization process through simple, direct intervention management methods (Hodges Exhibit M-19, at 5, paragraph 2). [KSBE FOF1431]

177. Today, scientists cannot conclusively state why certain streams have a full complement of aquatic animals while others do not. (Fitzsimons Tr. 01/11/96 at 47, lines 13-16). [KSBE FOF1432]

178. Although biologists would like to see streams returned to their original pristine conditions, it is expected that such conditions will not happen. Therefore, biologists would like to at least see the existence of reproductively viable populations of fishes in the streams. (Devick Tr. 02/13/96 at 131, lines 22-25; at 132, lines 1-5). [KSBE FOF1433]

179. The present flow of the stream has created conditions which are significantly different from those which prevailed before December of 1994. (Devick Tr. 02/13/96 at 179, lines 1-4). [KSBE FOF1434]

180. It makes a difference how the water is distributed into the streams. Water should be more equally distributed rather than most of it coming into Waiahole Stream. This is an unnatural restoration. It is merely restoring water into the stream, but restoration of streams involves a lot more. An attempt should be made to bring the volumes of water closer to the stream's natural flow. (Lowe Tr. 2/29/96 at 133, lines 9-25, at 134, line 1). [KSBE FOF1435]

181. At present, our knowledge of the endemic stream species is inadequate to define and quantify the acceptable reductions in stream flows, within reasonable confidence levels, to predict quantitative population improvements resulting from flow restoration. (Devick WDT 9/18/95, at 5). [KSBE FOF1458]

## **10. Instream Flow Protection and Techniques**

182. States began implementing instream flow protection laws in the mid-1950's. (Bovee Tr. 4/10/96 at 165, lines 4-5). [KSBE FOF1436]

183. There are several instream flow techniques. The "wetted perimeter technique" is the accepted method in Montana, Oregon, and Idaho. (Bovee Tr. 4/10/96 at 182, lines 4-5, 8-11). This technique basically says that "if it's wet, it's okay" (Bovee Tr. 4/10/96 at 183, lines 15). The depth or speed of the flow is not important. (Bovee Tr. 4/10/96 at 183, lines 16-18). [KSBE FOF1439]

184. The "wetted perimeter" is the distance across the bottom of the stream. (Bovee Tr. 4/10/96 at 182, lines 12-16). The "wetted perimeter" increases as flow increases and the channel begins to fill very rapidly. (Bovee Tr. 4/10/96 at 182, lines 23-25). At a certain point, the range of the "wetted perimeter" levels off. (Bovee Tr. 4/10/96 at 183, line 1). This point marks the minimum flow that would be the best for protecting the resource. (Bovee Tr. 4/10/96 at 183, lines 3-5). [KSBE FOF1440]

185. However, the "wetted perimeter technique" is not very good for doing impact assessments. It is difficult to determine what changes in wetted perimeter actually mean[s] in terms of fish. (Bovee Tr. 4/10/96 at 184, lines 5-7). In reality, the usable habitat in the stream reaches its peak out at some intermediate point. Thus, the higher the flows get, the habitat actually decreases because the stream gets too deep and too fast for most species to adjust. The habitat ends up disappearing. (Bovee Tr. 4/10/96 at 197, lines 19-22). [KSBE FOF1441]

186. Another problem is that the "wetted perimeter technique" is incapable of making a distinction between 1/100th of a foot of water and a hundred feet of water. (Bovee Tr. 4/10/198, lines 1-3). This technique is best applied to rectangular or square subsections of the stream. (Bovee Tr. 4/10/96 at 198, lines 8-10). It is least effective with cross-sections that are not "square" (such as braided channels that have islands between them). This is because there are too many deflection points and finding the correct one would be difficult. (Bovee Tr. 4/10/96 at 198, lines 18-21). [KSBE FOF1442]

187. Instream flow assessment involves developing a mitigation plan or a recovery plan, or some sort of an hands-on management plan for the actual operation of the water system. (Bovee Tr. 4/10/96 at 208, lines 16-25). Rather than coming up with one number to be the standard for a minimum flow, a whole range of numbers are produced which correspond to a series of rules on how to operate a reservoir with a limited water supply. (Bovee Tr. 4/10/96 209, lines 11-16). These assessments are more complicated and involved than doing one for a state water right. (Bovee Tr. 4/10/96 at 209, lines 17-20). [KSBE FOF1443]

188. The National Biological Service ("NBS") warrants an instream flow assessment whenever a proposed action will decrease the stream's base flow by ten percent (10%) or more. (Bovee Tr. 4/10/96 at 210, lines 24-25; at 211, lines 1-2). An assessment is warranted because reducing the base flow by ten percent (10%) will potentially have a significant impact on the stream. (Bovee Tr. 4/10/96 at 212, lines 17-20). [KSBE FOF1444]

189. Extremely low flows and extremely high flows can be detrimental to the stream habitat and its populations. (Bovee Tr. 4/10/96 at 170, lines 14-20). [KSBE FOF1445]

190. There are two (2) types of habitat limitations: acute habitat event and chronic

effects. Acute habitat events usually result in immediate mortality and depression of the population. They are often caused by high flows due to floods and other catastrophic events, such as landslides and dam breaks. (Bovee Tr. 4/10/96 at 171, lines 2-16). These are the most limiting and have the most effect on the number and strength of fish in the subsequent year. (Bovee Tr. 4/10/96 at 170, lines 21-25). [KSBE FOF1446]

191. Chronic effects are those that have a cumulative impact over a long period of time. (Bovee Tr. 4/10/96 at 171, lines 18-19). These are caused by low flows. (Bovee Tr. 4/10/96 at 171, line 20). Low flows tend to crowd the fish together, causing them to fight, lose weight, and develop poor conditioning going into the growing season. (Bovee Tr. 4/10/96 at 171, lines 23-25). Mortality occurs several months after the onset of the initial condition. (Bovee Tr. 4/10/96 at 172, lines 1-2). [KSBE FOF1447]

192. **[Restoring]** There was testimony presented that restoring all of the historic population will require the restoration of all of the historic habitat. (Bovee Tr. 4/10/96 at 200, lines 5-8). **[To]** Bovee believes start with a true historical baseline, one must start from scratch. This essentially means cutting off everyone from the stream, including the farmers. (Bovee Tr. 4/10/96 at 215, lines 1-3). [KSBE FOF1448]

193. A baseline is a set of conditions that is used as a reference point. (Bovee Tr. 4/10/96 at 215, lines 23-25). Aside from a historical baseline representing predevelopment days, one could also have a baseline representing current conditions with all the existing water users in place or have a baseline starting from zero. Having zero for a baseline, however, may require taking out the water, drying the stream for five (5) years and then starting over. (Bovee Tr. 4/10/96 at 216, lines 4-10). [KSBE FOF1449]

194. Two (2) types of approaches could be used in the process of recovering streams. One is the "habitat-based" approach. This process examines the historical stream habitat for various species of fish and how they would change as a result of different water management practices or different allocations of water back into the stream. (Bovee Tr. 4/10/96 at 172, lines 19-23). Initially, this system may not be effective in the steep stream conditions which is present in Hawaii. (Bovee Tr. 4/10/96 at 173, lines 3-4). However, the two-dimensional modeling system could make it effective. (Bovee Tr. 4/10/96 at 173, lines 6-8). [KSBE FOF1450]

195. The second approach is the "empirical" approach. This is a more direct method that would theoretically take the entire flow to the Leeward side and dump it back on the Windward side. This would then be used as a baseline condition and the population would be allowed to equilibrate to that condition and then reduce the flow in increments up to as much as fifty percent (50%). Subsequent populations are then monitored for changes. (Bovee Tr. 4/10/96 at 173, lines 10-18). [KSBE FOF1451]

196. The advantage of the empirical approach is that at the end, one will know what the population response will be to the allocation of water. (Bovee Tr. 4/10/96 at 173, lines 20-23). There is no need to consider what the water source is or other factors involved in the "habitat-based" model. (Bovee Tr. 4/10/96 at 173, lines 23-25). Furthermore, the entire flow does not have to be dumped. The partial releases may be used as a baseline so long as there is a starting point against which other things are evaluated. (Bovee Tr. 4/10/96 at 174, lines 8-14). [KSBE FOF1452]

197. The disadvantage of the empirical approach is the length of time needed to obtain a satisfactory answer in terms of what the impact would be to native Hawaiian fish communities. Such an approach could take as long as twenty (20) years. (Bovee Tr. 4/10/96 at 174, lines 16-22). [KSBE FOF1453]

198. Most of Hawaii's streams are technically straight and steep. Because of its steepness, when more water flows in, the water speeds up. However it does not get deeper or spread out more. (Bovee Tr. 4/10/96 at 199, lines 7-12). There are several ways of modifying the habitat of a low-flowing stream without changing the amount of water that was discharged into the stream. One method is to alter the channel's structure. Physical habitat for stream fish is a function of both channel structure and stream flow. (Bovee Tr. 4/10/96 at 176, lines 9-11). [KSBE FOF1454]

199. While structure does not affect water temperature and quality as much as stream flow, it is important in determining the actual living habitat for the fish. (Bovee Tr. 4/10/96 at 176, lines 12-15). For fish that prefer deep, slow-moving water, digging a hole in the stream would be more effective than adding more water. (Bovee Tr. 4/10/96 at 176, lines 16-18). [KSBE FOF1455]

200. Basically, it is better to gather years of accumulated data before deciding whether there was an impact. (Bovee Tr. 4/10/1996, lines 4-10). A buffer period of several years allows trends to develop and be monitored and it also accounts for bad years. (Bovee Tr. 4/10/96 at 191, lines 15-20). [KSBE FOF1456]

201. **[While] Bovee believes that while** putting all the water onto the Windward side is the ultimate thing you can do for the fish[. **However**], it may not be the best thing to do. (Bovee Tr. 4/10/96 at 195, lines 10-14). [KSBE FOF1457]

202. At present, our knowledge of the endemic stream species is inadequate to define and quantify the acceptable reductions in stream flows, within reasonable confidence levels, to predict quantitative population improvements resulting from flow restoration. (Devick WDT 9/18/95, at 5). [KSBE FOF1458]

## **11. Marine Ecology/Estuary**

### **a. Water Quality/Productivity Impacts on Kaneohe Bay**

203. Using the perturbation analysis, an assessment studying the fate of freshwater discharge flows from Waiahole Stream was performed. Perturbation analysis is the scaling of measured conditions to simulate changes due to variations in stream discharge. (Noda Tr. 4/23/96, vol. 2 at 27, lines 1-6). While perturbation analysis is not limited to salinity changes, it can be used to evaluate any constituent or parameter that is discharged with the Waiahole Stream water. (Noda Tr. 4/23/96, vol. 2 at 28, lines 23-25). [KSBE FOF1466]

204. Flow rates for Waiahole Stream were 15.6 MGD for June 5, 1995, 18.7 MGD for June 6, 1995 and 22 MGD for June 7, 1995. The measured flow rates for Waikane Stream were 1.3 MGD, 1.4 MGD, and 1.6 MGD for June 5, 6, 7, 1995 respectively. Using these measurements, the mean value for Waiahole Stream was therefore about 19 MGD and Waikane Stream it was about 1.4 MGD. (Noda Tr. 4/23/96, vol. 2 at 30, lines 6-9). [KSBE FOF1469]

205. Based on these measurements, the following three (3) reference points: five (5) MGD, 19 MGD, and 30 MGD were used as the base flows from Waiahole Stream into Kaneohe Bay. [The] A perturbation model by Noda showed that by comparing the base flow of 5 MGD with 19 MGD, there is only a 0.24 percent increase in the amount of area affected by the increased stream flow. (Noda Tr. 4/23/96, vol. 2 at 35, lines 23-25, at 36, lines 1-7. In other words, with a 19 MGD base flow, there is a relative increase of only 1.3 percent in the twenty (20) parts per thousand estuary area. (Noda Tr. 4/23/96, vol. 2 at 36, lines 22-25, at 37, lines 1-2). [KSBE FOF1470]

206. Similarly, if the base flow was increased to 30 MGD, the modeling showed that the baywide impacts due to the return of the diverted flow water would essentially be insignificant. In other words, the physical impacts associated with the mixing and transport of the increased base flow from Waiahole Stream would be confined to the immediate shallow water embayment between Waiahole and Waikane Streams. (Noda Tr. 4/23/96, vol. 2 at 37, lines 11-17). [KSBE FOF1471]

207. Coral reefs fit and develop best in an environment free of terrestrial influence. In other words, land influences such as freshwater, sediments and nutrients are harmful to coral growth. (Dollar Tr. 4/23/96 at 62, lines 6-22) [KSBE FOF1486]

208. Ocean salinity is around thirty-five (35) parts per thousand. (Jokiel Tr. 3/5/96 at 164, lines 2-3) Therefore, salinity of twenty (20) parts per thousand is a critical factor because it is an amount of salinity in water that will negatively impact corals. (Dollar Tr. 4/23/96 at 124, lines 12-21) Anything below twenty (20) parts per thousand such as fifteen (15) parts per thousand will kill corals. (Jokiel Tr. 3/5/96 at 164, lines 15-16). [KSBE FOF1487]

209. As such, decreased salinity in the ocean due to freshwater mixing with seawater can kill corals. (Jokiel Tr. 3/5/96 at 164, lines 2-19). However, it takes very special episodic events like the 1988 flood to cause mass mortalities of coral



reefs. (Jokiel Tr. 3/5/96 at 169, lines 12-17). [KSBE FOF1488]

210. This indicates that stream diversion will decrease salinities, especially closer to shore near the mouth of the Waiahole-Waikane Stream area. (Jokiel Tr. 3/5/96 at 170, lines 3-25; at 171, lines 1-7). While discharges that kill corals are often caused by flood events, floods are not the only cause of coral mortality. Other conditions at the stream mouth are unsuitable for coral larvae to settle such as a lot of sediment that hinders the development of coral reefs. This negative effect on corals is generally true in areas where streams enter reefs. (Jokiel Tr. 3/5/96 at 170, lines 3-16; at 176, lines 7-15). [KSBE FOF1489]

211. Furthermore, the changes in the surface area of Kaneohe Bay as it is affected by increased stream flow can be determined and quantified. Generally, any amount of increase is going to have some effects. (Jokiel Tr. 3/5/96 at 173, lines 2-21; at 174, lines 19-22). However, there is a certain amount of unpredictability because of other factors which impact salinity on a given flow. For example, an incoming tide pushes back how the salinities are set up. (Jokiel Tr. 3/5/96 at 174, line 1; at 175, lines 1-12). [KSBE FOF1490]

212. While major storms and flood events are what usually cause significant decreases in salinity, other amounts of freshwater input also influence salinity in terms of detectability. (Jokiel Tr. 3/5/96 at 177, lines 1-25; at 178, lines 1-19). [KSBE FOF1491]

213. Moreover, the lethal effect on corals has to do with two (2) factors: the intensity of the stress which means how low the salinity is, and the duration of exposure to that stress. Thus, both sufficient time and intensity is needed to kill corals. (Jokiel Tr. 3/5/96 at 179, lines 6-17). [KSBE FOF1492]

214. For example, if coral is put in a bucket of fresh water and then pulled out soon after, the coral would probably survive because the duration is too short. In fact, immediate exposure to even fifteen (15) parts per thousand, which is fifty percent (50%) fresh water and fifty percent (50%) seawater, would not instantly kill corals because longer exposure would be needed. (Jokiel Tr. 3/5/96 at 179, lines 6-25; at 180, lines 1-6). However, if coral is placed in such water for a twenty-four (24) hour period, the coral will die. (Jokiel Tr. 3/5/96 at 180, lines 11-15). [KSBE FOF1493]

215. Generally, fresh water that mixes with seawater forms a layer along the surface, while the corals lie at the bottom. This may alleviate the impact of the stream water on corals due to the lack of direct contact. However, releasing all the water to Waiahole Stream **[has] would have** no positive impacts on the coral. (Jokiel Tr. 3/5/96 at 180, lines 16-25; at 181, lines 1-9). [KSBE FOF1495]

216. There are three (3) different kinds of productivity applicable to the estuary system in Kaneohe Bay. First, primary productivity is the productions of green

plants. Second, the *detritus* is dead organic material and microbes which is the base of the food webs along the primary productivity. Third, secondary productivity, is essentially the consumers that feed on both the primary productivity and *detritus*. (Leber Tr. 04/23/96 at 159, lines 21-25; at 160, lines 1-8). [KSBE FOF1498]

217. There are several factors that control secondary productivity. However, it must be emphasized that food availability is not a critical factor. (Leber Tr. 4/23/96 at 161, lines 24-25, at 162, line 1). A study of strip[p]ed mullet since 1989 has established this factor. Strip[p]ed mullet is a classic estuary organism. It is classified as a pythagoras fish; in other words, a body of fishes or a group of fishes that must spawn in the marine high salinity sea water but whose juveniles move into bays and estuarines and up into rivers and streams to use as their nursery habitats. (Leber Tr. 4/23/96 at 162, lines 7-12). [KSBE FOF1501]

218. Strip[p]ed mullet prefer mud flats adjacent to the mouth of streams low salinity areas outside of the streams mouth. (Leber Tr. 4/23/96 at 163, lines 22-25, at 164, lines 1-14). Strip[p]ed mullet is a herbivore and a detritivore, which is a key point if someone is studying the impact of increasing plants and *detritus* on the food web. Strip[p]ed mullet feeds directly on those items. It is also a key linked to the plants and *detritus* in the upper levels of the food web. It is a link because it converts plants and *detritus* to a food source that other fishes can use. Thus, strip[p]ed mullet is a valuable indicator of ecosystem response to changes in productivity in the estuarines. (Leber Tr. 4/23/96 at 165, lines 7-15). [KSBE FOF1502]

219. However, fish abundances are dependant on several factors and productivity is only one of them. Productivity talks about food availability, habitat availability and habitat quality. In addition, the presence of predators in the form of bigger fishes and fisherman are important factors in setting abundances of strip[p]ed mullet and of the majority of inshore fishes. Competition among fishes over food and space is also an important factor. In addition, physical and chemical variables such as temperature, salinity, oxygen, the type of substratum, in other words the sea floor, water quality are important factors in establishing abundances of our inshore fishes. Thus, productivity is only one component. (Leber Tr. 4/23/96 at 165, lines 16-25, at 166, lines 1-9). [KSBE FOF1503]

220. While freshwater flow is an important factor to Kaneohe Bay, there are other factors such as high annual variability in juvenile recruitment and loss of critical habitat that impact fisheries in Kaneohe Bay. (Leber Tr. 4/23/96 at 166, lines 10-19). Lining of streams, deforestation, and increased sedimentation associated with channelization is likely interfering with *limu* production, which serves as food for indicator species. (Leber Tr. 4/23/96 at 168, lines 14-22). [KSBE FOF1504]

221. The loss of Hawaiian fishponds has certainly affected the abundances of inshore fishes like mullet at Kaneohe Bay. There were once thirty (30) of these Hawaiian fishponds in Kaneohe Bay, but now there are only twelve (12). Because

these fishponds contains much of the freshwater and productivity in a specific and concentrated area, these fishponds are excellent nursery habitats. (Leber Tr. 4/23/96 at 167, lines 1-11). [KSBE FOF1505]

222. Development [also] negatively impacted the fisheries in Kaneohe Bay. The lining of the streams with concrete channels has decreased inputs of wetland productivity into Kaneohe Bay. In other words, by lining the streams with concrete, the water during flood events or during high rainfall is prevented from moving up the banks to collect and transport nutrients into the bay. Channelization also prevents vegetation lining the streams from filtering sediments out of the stream water. As such, lining the streams and deforestation has greatly increased sedimentation into Kaneohe Bay. Such increase in sedimentation is also likely interfering with limu production. (Leber Tr. 4/23/96 at 167, lines 24-25, at 168, lines 1-25). [KSBE FOF1506]

223. There is a direct relationship between development on the Windward side and pollution in Kaneohe Bay. Such pollution would take a number of forms such as silt runoff and sewage effluent. Therefore, urban development and pollution did considerable damage to Kaneohe Bay. (Devick Tr. 02/14/96 at 41, lines 12-25; at 42, lines 1-25; at 43, lines 1-21). [KSBE FOF1507]

224. Oceanic Institute's recent studies have shown that the limits of inshore fish abundances in Kaneohe Bay is largely due to lack of recruitment. In 1993, by using stock enhancement experiments, it was discovered that many nursery habitats in Kaneohe Bay are actually below carrying capacity. Even degraded nursery habitats like Kahaluu, which has been channelized and diverted, have indicated major increases in recruitment due to release of hatchery fishes. In other words, despite the degraded nursery condition at Kahaluu, the hatchery fish did not displace the wild fish because there is enough food and space for these animals. (Leber Tr. 4/23/96 at 169 - 73, lines 1-25). [KSBE FOF1508]

225. Consequently, primary production and detritus are not the primary factors limiting fishes like mullet in Kaneohe Bay. The current nursery habitats are capable of supporting large increases of juvenile mullet even during good recruitment years like 1993. Thus, the current levels of natural productivity are not being fully utilized. The nursery habitats in Kaneohe Bay are currently below capacity. (Leber Tr. 4/23/96 at 173, lines 17-25, at 174, lines 1-3). [KSBE FOF1509]

226. Unless recruitment limitations are overcome, increasing food and habitat would not necessarily increase fish abundances. As such, simply reintroducing water from Waiahole Ditch into Waiahole Stream is not a panacea for remedying the destruction that has occurred to Kaneohe Bay and its fisheries. (Leber Tr. 4/23/96 at 174, lines 17-24). [KSBE FOF1510]

227. Based upon the available evidence, simply increasing base flow in the Windward streams will do little to bring back the fisheries in Kaneohe Bay. Instead,

a balanced approach should be implemented to manage fisheries. First, prevent overfishing by sound regulations and enforcement. Second, protect the existing habitat. Third, restore critical nursery habitats by, among other things, implementing propagation releases as a way to rapidly restore selected depleted stocks. Finally, publicly educate everyone about the need to protect aquatic resources. (Leber Tr. 4/23/96 at 184, lines 20-25, at 185, lines 1-14). [KSBE FOF1511]

228. There are no adequate scientific studies that would refute or support any hypothesis that fishes in Kaneohe Bay require fresh water input as a factor to their survival versus other characteristics of the bay, such as the oceanography, morphology, pollution, introduced exotic predatory species, over-fishing and habitat destruction. (Lobel Tr. 4/11/96 at 89, lines 11-22; at 90, lines 8-9). [KSBE FOF1512]

229. What makes a good habitat for species involves many things. This includes chemistry, morphology, physical flow characteristics, and the components of the biota. (Lobel Tr. 4/11/96 at 114, lines 4-7). [KSBE FOF1513]

230. While it is true that structure is one of the limiting factors that limits the number of fishes that can be found, there are many other factors which include an abundance of *limu* or other types of things that fishes can feed on. (Lobel Tr. 4/11/96 at 114, lines 11-14). [KSBE FOF1514]

231. In addition, fishing has had a tremendous impact on the present abundance of fish in Kaneohe Bay. (Lobel Tr. 4/11/96 at 137, lines 20-21). [KSBE FOF1515]

232. What makes Kaneohe Bay an important habitat is not so much the salinity factor per se, but involves the morphology in the sheltered areas of the bay. (Lobel 4/11/96 at 127, lines 19-25; at 128, lines 1-5). [KSBE FOF1516]

233. Nursery grounds are very important as they are usually in coastal areas. It is clear that those are areas that have a lot of fresh water input. However, what we do not know is that the physiology of the fish in these areas is dependent on fresh water. (Lobel Tr. 4/11/96 at 102, lines 9-14). [KSBE FOF1517]

234. There is also a relationship between higher flows and fisheries. If there is a higher flow, there is going to be a higher delivery rate of leaf material to the offshore area. There is going to be more particles washing down the stream including leaf and sediments, which translates to a greater availability of food. (Lowe Tr. 2/29/96 at 119, line 25, at 120, lines 1-15). [KSBE FOF1518]

235. With respect to streams and freshwater input, there is a lot more involved **[in] than** just looking at the flow rates. You must also look at the number of pools, refugia, plants and the chemistry of the water when the plants dissolve. (Lobel Tr. 4/11/96 at 114, lines 15-22). [KSBE FOF1519]

236. Back in the 1920s, fish were plentiful in the bay. When Mr. Uyemura first began to live there, approximately ten (10) fishponds surrounded the Kaneohe Bay area. (Uyemura Tr. 03/05/96 at 125, lines 1-21). [KSBE FOF1520]

237. Fishpond operators stock their farm by utilizing the water gates to bring the fish in. This practice is the traditional *makaha* method of capturing fish. This method required the fishpond operators to find *pua* (baby fish) at the mouths of Kahuluu or Waiahole streams. (Uyemura Tr. 03/05/96 at 127, lines 17-25; at 149, lines 7-8; at 128, lines 1-23). [KSBE FOF1521]

238. Although Waiahole serves as a productive area for fish larva, most of the fish migrate out of the area. As they migrate, many of the fish are attacked by other fish. (Uyemura Tr. 03/05/96 at 126, lines 24-25; at 127, lines 1-16). Kaneohe Bay also functions as a feeding area. *Aji'i*, *papio*, *ulua*, and other kinds of big fish all feed on the young larval fish that come out of the streams and ponds. (Uyemura Tr. 03/05/96 at 148, lines 1-14). [KSBE FOF1522]

239. Similarly, the way in which fishponds are run have changed over the years. These changes have come about by man. One example is the introduction of exotic fish to freshwater ponds. Exotic fish feed off the rest of the population. (Uyemura Tr. 03/05/96 at 133, lines 13-24). Snappers, tunas, talapia, and gold-spotted herrings are some examples of these predators. If people want to keep their fish supply stable, they should be very careful as to what kinds of fish they introduce into their pond. (Uyemura Tr. 03/05/96 at 145, lines 12-25; at 146, line 1). [KSBE FOF1523]

240. In the 1920s and 1930s, it was easier to harvest mature mullets. During spawning season, they would come right through the gates. In general, there were more fish to catch at this time because people fished less. Furthermore, fisherman did not fish on boats with outboard motors, nor did they use monofilament netting. It was these developments that greatly contributed to abatement of certain fish populations. Unfortunately, monofilament nets catch everything in their path. (Uyemura Tr. 03/05/96 at 137, lines 19-25; at 138, lines 1-25; at 139, lines 1-2). [KSBE FOF1524]

241. Poachers also substantially contribute to the decline in the number of fish in freshwater. (Uyemura Tr. 03/05/96 at 126, lines 1-7). Their actions limited the amount of fish that would eventually be harvested from the pond. (Uyemura Tr. 03/05/96 at 141, lines 22-25; at 142, lines 1-7). [KSBE FOF1525]

242. Since fishing conditions change so drastically from day to day, it is very difficult to decide exactly what factors are really affecting the conditions. It could be the amount of rainfall, the type of spawn that has occurred, the presence of predators and many other things. Also, as fish mature, they migrate. An increased fresh water flow may just keep the fish around a little longer. (Uyemura Tr. 03/05/96 at 144, lines 5-25; at 145, lines 1-9). [KSBE FOF1528]

243. Development, in general, contributes to a decline of fish. Specifically, the decline of the mullet may be due to the building of culverts off of Kahaluu Stream. A culvert takes the rainwater directly to the ocean. Therefore, the water cannot absorb nutrients as it flows down to the ocean. (Faris Tr. 3/5/96 at 195, lines 21-25; at 196, lines 1-4, 8-13). [KSBE FOF1529]

244. The purpose of gill net fishing is to catch certain types of fish. However, because the nets are suspended in the water like fences, they trap many kinds of fish that are not supposed to be caught. Even the new monofilament nets are too small for the fish to see. Therefore, they continue to kill *keiki* (young) fish before they have a chance to mature and reproduce. (Faris Tr. 3/5/96 at 193, lines 13-23). Monofilament nets began to be used more prevalently beginning in the early 1960's. (Faris Tr. 3/5/96 at 194, lines 3-9). [KSBE FOF1530]

245. Although silverfish are attracted to fresh water areas, the reef type fishes do not tolerate fresh water well. They tend to move to the outlying areas of the bay. Therefore, more fresh water only makes more room for the silver type fish like the *awa*, *'ama'ama* and *aholehole*, *opelu*, and *akule*. (Faris Tr. 3/5/96 at 183, lines 16-24; at 184, lines 1-2, 9-12). For example, during years of heavy rainfall, it looks as if the reef dies and reef fish migrate out to deeper waters. They do not return until the next dry season. (Faris Tr. 3/5/96 at 189, lines 13-20; at 190, lines 1-2). [KSBE FOF1531]

246. Over fishing and the clearing of plants around streams will have an impact on fisheries. The removal of plants takes away the shade, especially over the streams, resulting in heating up of the stream. (Lowe Tr. 2/29/96 at 162, lines 13-25, at 163, lines 1-25, at 164, lines 1-7). [KSBE FOF1532]

247. There are trends in terms of fish availability in Kaneohe Bay by species from 1948 through 1993. The trends show that there was a decline from 1948 until about 1960. (Lowe Tr. 2/29/96 at 169, lines 2-22). The trend began increasing up until 1967. Then, the trend began to fluctuate up and down, which is characteristic of over fishing effects. It continues to fluctuate until 1978 and then a steady decline continued until the present. (Lowe Tr. 2/29/96 at 170, lines 8-18). [KSBE FOF1533]

248. Large fluctuations in fishery yield could result from rainfall and temperature. (Lowe Tr. 2/29/96 at 173, lines 16-20). For example, goatfish went from 5,000 pounds in 1991 down to 2,400 pounds in 1992. (Lowe Tr. 2/29/96 at 173, lines 1-5). [KSBE FOF1534]

249. There are almost 5,000 commercial fishing licenses in the State of Hawaii. (Lowe Tr. 2/29/96 at 180, lines 24-25, at 181, lines 1-13). The ratio of the amount of recreational to subsistent fishers in Kaneohe Bay are seventeen (17) to thirty-six (36). These are estimates based upon numbers from the U.S. Fish and Wildlife Service and also on the Pacific Gamefish Foundation. (Lowe Tr. 2/29/96 at 180,

lines 6-21). [KSBE FOF1535]

250. It is estimated that the ratio of the number of recreational fisherman to one (1) commercial fisherman is seventeen (17) to one (1). (Lowe Tr. 2/29/96 at 186, lines 21-25, at 187, line 1). However, it is only an approximate ratio. (Lowe Tr. 2/29/96 at 187, lines 5-8). [KSBE FOF1536]

251. The contributors to the declining fish are overfishing, habitat degradation due to erosion and sedimentation, rearrangement of the bay, and urbanization of the watershed. (Lowe Tr. 3/5/96 at 40, lines 8-25). All these factors are interrelated and as such, efforts are needed to improve these conditions before fishing improves. (Lowe Tr. 3/5/96 at 41, lines 17-20). [KSBE FOF1537]

252. Four hundred fifty (450) species of *limu* grow in Hawaii. Three hundred fifty (350) of these species are edible. (Abbott Tr. 03/06/96 at 236, lines 3-6). Most Hawaiians incorporate edible *limu* into their everyday diets. (Abbott Tr. 03/06/96 at 234, lines 12-25; at 235, lines 1-4). [KSBE FOF1538]

253. If you look at the total number of algae on Oahu, there has not been a decrease in *limu* availability. However, the availability of edible *limu* has declined in all the areas where this kind of seaweed can be found; therefore, private enterprise began to import certain seaweeds from abroad. The decline of edible *limu* has a direct relationship to the number of people who are looking for it. The various ethnic groups that have come to Hawaii with their different picking habits have contributed to the depleting of our *limu* reservoirs. Therefore, the change in both the size and diversity of Hawaii's population has made an impact upon the availability of edible *limu*. (Abbott Tr. 03/06/96 at 245, lines 21-25; at 237, lines 3-5; at 246, lines 1-7, 11-20). [KSBE FOF1539]

254. Both nutrient content and salinity are factors that affect *limu* growth. (Abbott Tr. 03/06/96 at 239, lines 2-14). The average reduced salinity for seawater is 33.3 parts per thousand. The average for brackish water is twenty-eight (28) parts per thousand. An acceptable location to pick *limu* is in a pond or stream that contains brackish water. However, edible seaweeds are common seaweeds and can tolerate large differences in salinity, large differences in nutrients, and differences in substrates. (Abbott Tr. 03/06/96 at 239, lines 22-25; at 240, line 1). [KSBE FOF1540]

255. Scientific research is still unclear as to the precise relationship between salinity and *limu* growth. Studies that have been done are inconclusive because the water content varies a great deal over a twenty-four (24) hour period. It is very difficult to decide what the average salinity should be. Water samples would also drastically differ if taken everyday at the same time for a month. This is because it rains and because the level of the tide varies. (Abbott Tr. 03/06/96 at 243, lines 15-25; at 244, lines 1-3). [KSBE FOF1541]

256. Certain species of seaweed or *limu* are affected differently by specific factors. For example, some *limu* would flourish with the introduction of additional nutrients. Others would wither up and die. (Abbott Tr. 03/06/96 at 250, lines 24-25; at 251, lines 1-8). As for salinity, the absence of it may slow down *limu* growth. Again, this depends on the type of species the *limu* is and whether or not other factors remain constant. (Abbott Tr. 03/06/96 at 244, lines 10-25; at 245, lines 1-7). [KSBE FOF1542]

257. **[The] Abbott testified that the** overall decline of seaweed on the island of Oahu is mostly due to the population pressure. (Abbott Tr. 03/06/96 at 247, lines 3-4). [KSBE FOF1543]

258. **More** specifically, the *limu* has disappeared along Waiahole-Waikane because of the spreading of mangrove that comes from the Hakipu'u Stream mouth. (Abbott Tr. 03/06/96 at 248, lines 16-25). [KSBE FOF1544]

#### **b. Kaneohe Bay Ecosystem in General**

259. There are many variables involved when conducting an ecosystem study. These include the freshwater system, the deep sea system, climatic features, water quality analysis, and nutrient loading. (Livingston Tr. 3/13/96 at 71, lines 14-21). [KSBE FOF1545]

260. From a scientific standpoint, restoring Waiāhole and Waikāne streams would be particularly useful, because the relative absence of pollution and urbanization would allow a scientist to factor out those influences and study the impact of increased flow in relative isolation. Robert Livingston, March 14, 1996, p. 60, ll. 14-18. [WWCA FOF346]

261. It is scientifically well established that a freshwater influx in one area may cause increased recruitment in other nearby areas, and it is therefore possible that the increased abundances observed at Kahalu'u Stream resulted from the increased flow at Waiāhole. Robert Livingston, July 3, 1996, p. 21, ll. 9-17; p. 25, ll. 20-25; p. 26, ll. 1-7. [WWCA FOF365]

262. High base flow is important to the estuary ecosystem as well as the stream itself. The flows generated during storm events perform a function different from that of base flows. The estuary does not assimilate a great deal of nutrients from flood events, because the water moves through the system so rapidly. Those flows flush out the estuarine system. The base flow carries the steady load of nutrients that is essential for estuary productivity, and is essential to sustain the nutrient levels throughout the year. Robert Livingston, July 3, 1996, p. 15, ll. 20-25; p. 16, ll. 1-9; George Uyemura, March 5, 1996, p. 129, ll. 19-21. [WWCA FOF374]

#### **c. Maintenance of Kaneohe Bay**



263. There has been a dramatic decline in fish and limu in Kaneohe Bay since 1960. Factors contributing to the decline are urbanization, over-fishing, poaching, pollution, sediment run-off, dredging, sewage spills, algae blooms, growth of mangrove, development of culverts (cementing the sides of streams) and habitat degradation. Devick, Tr., 2/14/96, P43/L9-12; Leber, Tr., 4/23/96, P165/L21-24, P166/L19-22, P168/L1-2, P168/L21-22; Lowe, Tr., 2/29/96, P144; Abbott, Tr., 3/6/96, P247, 298; Faris, Tr., 3/5/96, P191, 192-193, 196; Livingston, Tr., 3/13/96, P143; J. Reppun, Tr., 4/24/96, P112/L15-21; Uyemura, Tr., 3/5/96, P141/L22-P142/L7, P142/L24-143/L7. The synergism of these factors is worse than the effects of any single factor. Lobel, Tr., 4/11/96, P136-138. [WIC FOF259]

264. Although decrease in stream flow may have been a factor affecting fish populations in Kaneohe Bay, scientists are unable to quantify the correlation between stream flow and improved fish habitat. Lowe, Tr., 2/29/96, P142, 144. [WIC FOF265]

265. **[Data] It is Dr. Livingston's opinion that data** collected over a period of 8-9 years would be necessary before any valid scientific conclusions can be reached as to how various factors affect the actual productivity and biological organization of Kaneohe Bay. Livingston, Tr., 3/14/96, P8. [WIC FOF266]

## **12. Aesthetic Values**

266. The aesthetic value of water is subjective and cannot be quantified. Ferguson, Tr., 4/10/96, P241-243; Ferguson, WDT (affidavit), P3/¶7. [WIC FOF270]

## **C. Water Use Permit Applications**

Water use permits are required for any use of ground water in a ground water management area. Section C begins with a chronology which includes WIC's initial application in June 1993, amendment of WIC's original application in June 1994 to include the State DLNR (Joint Application), KSBE's application in September 1994, further amendment of the Joint Application in October 1994 to include nine (9) applicants, and Dole/Castle & Cooke's application in October 1994. Section C discusses in detail the findings of facts presented by each party requesting a water use permit, as well as the findings of fact presented by interested parties Del Monte, Hawaii Farm Bureau, and the Navy.

### **1. Chronology - leeward applications for water uses**

267. On May 5, 1992, the Commission designated the aquifer systems of Windward Oahu as a groundwater management area, effective as of July 15, 1992. In such a groundwater management area, a water use permit from the Commission is required for any withdrawal, diversion, impoundment, or consumptive use of groundwater. Only domestic consumption by individual users (i.e. residences) are exempt from filing application. Therefore, effective as of July 15, 1992, users of

Windward Oahu groundwater are required to apply for water use permits. [KSBE FOF19]

268. In response to this requirement and the announced closure of OSCO in the summer of 1993, various parties filed their water use permit applications, reservations for water, and petitions for interim instream flow amendment. [KSBE FOF20]

269. On June 3, 1993, pursuant to Hawaii Revised Statutes ("HRS") Section 174C-51, as amended, and Hawaii Administrative Rules ("HAR") Section 13-171-12, as amended, WIC, wholly-owned by OSCO, filed an initial water use permit application for continued use of the Waiahole Ditch ground water to irrigate OSCO's sugar cane fields in Central and Leeward Oahu. The application was filed within one (1) year after the Windward groundwater management area was designated. [KSBE FOF21, WIC FOF53, PMI FOF1, WBE FOF1, ROR FOF1]

270. On June 14, 1994, the original application was amended to reflect future planned uses for these waters. Among other things, the amended application included[,] ~~the~~ State of Hawaii Department of Land and Natural Resources ("DLNR") as a co-applicant (hereinafter referred to as "Joint Application"). [KSBE FOF22, WIC FOF54, PMI FOF2, WBE FOF2, ROR FOF2]

271. On September 28, 1994, KSBE filed a WUPA for 4.2 mgd ~~of~~ water from the Waiawa Development Tunnel (Well No. 2657-05), which is situated within the Waipahu-Waiawa Water Management Area for existing irrigation uses at Waiawa nursery and nonpotable irrigation uses at the proposed Waiawa by Gentry Project (the "KSBE WUPA"). [WIC FOF55, KSBE FOF24]

272. On October 24, 1994, ~~[this]~~ ~~the~~ Joint Application was further amended and the number of applicants increased to the following nine (9) applicants: WIC or Amfac/JMB Hawaii ("Amfac/JMB"), DLNR, The Estate of James Campbell ("Campbell Estate"), Robinson Estate, Department of the Navy ("Navy"), Halekua Development Corporation ("Halekua")(also known as "Royal Oahu Resort"), Puu Makakilo, Nihonkai Lease Co. and West Beach Estates. These nine (9) applicants indicated the following water needs:

- A. Amfac/JMB's application is for .75 MGD of water for existing golf course irrigation at Waialeale Golf Club;
- B. Campbell Estate requests 12.09 MGD of water for new and existing agriculture uses;
- C. Halekua Development Corporation requests 3.00 MGD of water for existing golf course irrigation and new agriculture uses at Royal Kunia;
- D. The Navy's request is for 2.54 MGD of water for new agriculture uses at Navy lands in Central Oahu;
- E. Puu Makakilo requests 1.00 MGD of water for new golf course irrigation use at Makakilo Golf Course;

F. The Robinson Estate's application is for 5.96 MGD of water for existing agriculture uses at Robinson Estate lands in Central Oahu;

G. DLNR requests 6.43 MGD of water (as amended on March 30, 1995 to include a request for .15 MGD for the Waiawa Correctional Facility) for new agriculture use by Del Monte, new short term agriculture at Kapolei and new irrigation of Kapolei Golf Course and landscaping at Kapolei;

H. West Beach Estates requests 1.64 MGD of water for new agriculture and landscaping and golf course irrigation at Ko Olina Resorts Phases 1 and 2; and

I. Nihonkai Lease Co. requests .50 of water for existing agriculture use in Central Oahu. [KSBE FOF23, WIC FOF57, PMI FOF4, WBE FOF3, ROR FOF3]

273. On October 5, 1994, Dole Food Company, Inc. ("Dole/Castle & Cooke") applied for a water use permit for 2.7 MGD of ground water that is developed by the Uwau Tunnel Extension for existing agriculture, landscaping irrigation at Mililani Memorial Park and golf course irrigation of Mililani Golf Club; drinking water and water sale to WIC. [KSBE FOF25, WIC FOF56]

274. The term "Joint Applicants", as used herein, shall include Campbell Estate, Robinson Estate, Dole/C&C, WIC, State Department of Agriculture ("DOA"), Royal Oahu Resort, Inc. ("Royal Oahu"), Puu Makakilo, Nihonkai and DLNR.

The Joint Applicants' amended request for water is as follows:

a.	Campbell Estate:	12.09 mgd
b.	Robinson Estate:	5.50 mgd
c.	Dole/C&C:	2.74 mgd
d.	WIC:	2.00 mgd
e.	DOA Ag Park (Halekua):	0.75 mgd
f.	Royal Oahu:	0.75 mgd
g.	Puu Makakilo:	0.75 mgd
h.	Nihonkai:	0.50 mgd
i.	DLNR (Waiawa Correctional):	<u>0.15 mgd</u>
	TOTAL	<u>25.23 mgd</u>

Letter to the Commission from Campbell Estate, Robinson Estate, Dole/C&C, WIC, DOA, Royal Oahu, Puu Makakilo, Nihonkai and DLNR, dated October 2, 1995 (the

"10/2/95 Clarification Letter"); Dole/C&C WUPA. [WIC FOF58]

275. The Joint Applicants' total request for Waiahole Ditch water, as amended, is 25.23 mgd at the North Portal. 10/2/95 Clarification Letter; Dole/C&C WUPA. [WIC FOF59]

276. No applications for any competing water uses of Waiahole Ditch water were filed by any of the Windward parties. [WIC FOF60]

## **2. Water Use Permit Applicants and Water Users**

### **a. Campbell Estate**

277. Campbell Estate has approximately 2,600 acres in the footprint area of the Leeward plains. [Currently, approximately 8.6 million gallons are being used in this area.] Outside the footprint area, Campbell has approximately 1,400 acres of land that was taken out of cane production in the early 1980s by OSCO. These lands, like the footprint area, will be used for diversified agriculture. Therefore, Campbell Estate is requesting another 3.83 million gallons per day for this area. (Russell Tr. 11/29/95 at 167, lines 12-14; at 168, lines 12-20; at 171, lines 21-25; at 172, lines 1-14). [KSBE FOF665]

278. Historically, OSCO leased the land to grow sugar cane. When OSCO went out of business, Campbell Estate entered into leases with farmers and ranchers to grow feed crops and diversified crops and to pasture animals on this land. (Goth Tr. 11/30/95 at 34, lines 3-7). [KSBE FOF669]

279. Urbanization of the Campbell Estate's mauka of H-1 Freeway agricultural lands will only occur if state and county approvals to change the land use zoning and the water use are obtained. Goth, WDT, 9/18/95, P5/L13-16. [WIC FOF192]

### **1) Larry Jefts - Campbell Lands**

280. With regard to the Campbell lease, Jefts is leasing about 2,400 acres. Of the 2,400 acres, about 409 acres **[are] were** served by the Waiahole Ditch system in the final OSCO crop cycle, and probably several hundred more acres were served by the ditch. For the first two (2) years of the lease, he will not pay any rent, only taxes, but will pay \$175 per acre per year thereafter. This applies to about 400 acres of arable land, leaving about 2,000 acres remaining. (Jefts Tr. 12/12/95 at 91, lines 21-23; at 92, lines 1-4; at 93, lines 1-9). [KSBE FOF678]

281. Jefts is leasing, for a fifteen (15) year term expiring 2010, about 1,200 acres of red lands from Campbell at a cattle pasture rate of \$10 per acre, and some that is waste land at a lower rate of \$1 per acre. But, if the red lands are used for crop, the rate would probably increase to the regular \$175 per acre per year rate for arable land. (Jefts Tr. 12/12/95 at 126, lines 7-13; at 127, lines 9-10, 13-22; 130 at 19-22).

[KSBE FOF679]

282. Jefts' Campbell lease also specifies that average water usage is about 2,500 gallons per day per acre of arable land, and that if at least seventy-five percent (75%) of the 2,500 gallons, or 1,875 gallons, per acre per day is not made available to **the** lessee by July 1, 1996, or any time, then **the** lessee can terminate the lease. While this is not necessarily an indication of Jefts' water needs since it is probably the least amount he could survive with, it was settled for as a compromise during negotiations. Just as Jefts cannot guarantee that he could survive paying more than 47 cents per thousand gallons of water, he also cannot guarantee that he would survive at 1,875 gallons per acre per day. Although Campbell has leases with other tenants, like Del Monte, in which they reserve the right to subsidize its tenants's water costs to avoid triggering their right to terminate if water costs get too high, Jefts has no reason to believe they would do the same for him since he is a completely different party. (Jefts Tr. 2/27/96 at 52, lines 20-25; at 53, lines 1-25; at 54, lines 1-25; at 55, lines 1-25; at 56, lines 1-6). [KSBE FOF680]

283. Jefts agrees that there is a logistic advantage in being on Oahu in the Kunia lands because of decreased transportation costs since the ocean freight aspect is gone. (Jefts Tr. 12/12/95 at 108, lines 21-25; at 109, lines 16-23). [KSBE FOF685]

284. Jefts' contracts with Campbell and Robinson include land near Kunia Road; and both properties include adjacent buffer zones and gulches on both sides. He intends to have cattle/livestock operations in the gulches which lie outside the cultivated field. (Jefts Tr. 12/12/95 at 53, lines 11-17; at 54, lines 6-8, 12-19). [KSBE FOF686]

## 2) Hawaiian Sugar Planters Association

285. Hawaiian Sugar Planters Association's ("HSPA") land at the Kunia substation is very productive as it has well-drained soils, a moderate slope, and is very well-situated. (Osgood Tr. 12/12/95 at 138, lines 20-21). [KSBE FOF688]

286. Since 1961, the HSPA has had a lease with the Campbell Estate for seventy-eight (78) acres of land at \$1 per acre per year, plus a payment of the property tax. (Osgood Tr. 12/12/95 at 137, lines 7-9, 21-25; at 138, lines 3-5). [KSBE FOF689]

287. Until 1982, this Kunia land was exclusively used for sugar cane research. Then, in 1982, the HSPA started receiving State funds to do diversified crop research. It looked first at forage crops and then branched out into beverage crops such as coffee and chocolate. More recently, it has done some work with vegetable crops and taro. Currently, the HSPA is specializing in vegetable crop production and **[have] has** identified new crops such as asparagus which, at this time, is being 100% imported. Thus, asparagus grown as a commercial crop has the potential for reducing import and opening up export for asparagus in Hawaii. (Osgood Tr. 12/12/95 at 138, lines 16-25; at 139, lines 1-15). [KSBE FOF690]

288. With the downsizing of the sugar industry, the HSPA has been given the authority to do research on a wider scale, including doing contracted research for other farmers as part of its local farm consulting. For example, the HSPA has done seed production research in its Kunia facility. It has grown a fair amount of pepper seed and grows all of the super sweet corn that is used by the farmers in the State and supplies them for their production purposes at reasonable prices. (Osgood Tr. 12/12/95 at 144, lines 3-20). [KSBE FOF695]

**b. Robinson Estate**

289. The Robinson Estate has approximately 2,200 acres in the Kunia area: 1,500 acres that are useable agriculture land; 400 to 415 is gulch; approximately 100 acres is contributory lands and approximately 200 acres is wasteland. (Paty Tr. 11/29/95 at 118, lines 11-22). [KSBE FOF597]

290. Aloun Farms, represented by Alex Sou, has a license with Robinson Estate to farm approximately 282 acres [**comprising**] **comprised** primarily of Asian vegetables such as daikon radish, bok choy, tai choy, choy sum, and three kinds of lettuce. This is primarily a family operation. (Paty Tr. 11/29/95 at 122, lines 5-18). [KSBE FOF599]

291. Approximately 200 acres of Robinson's agricultural lands are being licensed to Huliwai Tropical Plantation. Finally, approximately forty (40) acres of bananas are being farmed by Eiko Nakama. (Paty Tr. 11/29/95 at 122, lines 19-25; at 123, lines 1-9). [KSBE FOF600]

292. Besides using the water for diversified agriculture, Robinson Estate [**needs**] **is requesting** approximately 300,000 gallons per day for tropical plantings, fruit trees, horses and cattle located in the gulches of the Robinson Estate lands. (Paty Tr. 11/29/95 at 126, lines 1-18). [KSBE FOF602]

293. Robinson Estate's [**leases**] **licenses** are for a term of fifteen (15) years. The [**lease**] rent is based upon a sliding scale where farmers are charged \$30.00 per acre for the first year, \$60.00 per acre for the second year, \$120.00 per acre for the third year, and \$180.00 per acre for the fourth year. Based upon the current [**leases**] **licenses**, the various farmers may terminate their [**lease**] **license** if the water costs exceed[s] 47 cents per thousand gallons. The farmers felt that beyond this threshold figure, they might have to seriously re-examine their economic viability. (Paty Tr. 11/29/95 at 139, lines 17-23; at 142, lines 16-25; at 144, lines 21-25; at 145, lines 1-22). [KSBE FOF603]

**1) Larry Jefts**

294. In Central Oahu, after seeking out the Robinson and Campbell Estates, Jefts licensed Robinson land and leased Campbell land. (Jefts Tr. 12/12/95 at 52, lines 13-19; at 53, lines 6-8; at 87, lines 18-23). The only difference between a lease and

license that Jefts is aware of is that in his lease with Campbell, he signed a non-disclosure which means he cannot discuss the terms of the lease. (Jefts Tr. 12/12/95 at 86, lines 13-25; at 87, lines 1-3). [KSBE FOF611]

295. More specifically, Jefts licensed 1,453 acres of land from Robinson Estate which began in July of 1995 for a fifteen (15) year term expiring in the year 2010. Upon signing the license, though not necessarily understanding the magnitude of the Waiahole Ditch water problems, he was aware that there were no water guarantees. (Jefts Tr. 12/12/95 at 85, lines 11- 25; at 88, lines 11-23). [KSBE FOF612]

296. Of the 1,453 acres, about 862 acres are usable. Of these usable acres, he pays \$30 per acre per year for the first year, \$60 per acre per year for the second year, and \$120 per acre per year for the third year, and \$180 per acre per year for the fourth year. After the fourth year, the rate may change and indexed to producer price (i.e the fourth year price and indexed from there). In addition, Jefts pays about \$10 per acre per year, the cattle pasture rate, for the remaining 591 acres, but did not pay any other fees for the Robinson lands. (Jefts Tr. 12/12/95 at 89, lines 1-25; at 90, lines 1-11). [KSBE FOF613]

297. Further, Jefts does not have a specific number for pumping costs to their mauka Robinson fields because they have not yet created the permanent infrastructure; however, it may roughly be in the 10 to 15 [set] cents per 1,000 gallon range for a small portion of the top-most field, less in another field with a 2 to 3 percent [grading] gradient, and then reduced numbers for the field below the ditch. The price and the availability of water are the two (2) ways that Jefts, as licensee, can terminate his license, with the opt-out price being about 47 cents. (Jefts Tr. 12/12/95 at 97, lines 17-25; at 98, lines 4-10). [KSBE FOF614]

298. For example, the 35 cents per thousand gallons of Waiahole is only an initial number which may be increased to up to 50 cents after calculating the whole cost of water including the cost to lift, pump, pressurize, filter, chlorinate, and deliver it to the fields. (Jefts Tr. 2/27/95 at 34, lines 1-16). [KSBE FOF627]

299. The ongoing transition from sugar fields to their intended operations includes adjusting soil pH, cultivation, etc. (Jefts Tr. 12/12/95 at 54, lines 23-25; Tr. 12/12/95 at 55, lines 1-2). [KSBE FOF615]

300. Realistically, full production will take at least another three (3) years. (Jefts Tr. 12/12/95 at 62, lines 2-10). Jefts calculates the three (3) year estimate based on the fact that they are a family operation which must survive and so they plan for the worst case scenario. He starts out planning for one crop, and if the crop and crop mix works, he does not see a practical limitation for 1.5 crops per acre per year. (Jefts Tr. 12/12/95 at 81, lines 11-22). [KSBE FOF620]

301. Because crop cycling is market driven and changes constantly, it would be difficult to say how many acres is in crop or laying fallow in any given day. He

plants and knocks fields down daily, so he does not track the number of acres in crop on any given day. (Jefts Tr. 12/12/95 at 101, lines 9-25). [KSBE FOF622]

302. In general, with respect to water use, the peak demand number is more important than the average number; however, because Jefts has been there for less than a year, he cannot predict with certainty the number of gallons they will need. (Jefts Tr. 12/12/95 at 63, lines 14-25; at 64, lines 1-2, 8-15). [KSBE FOF624]

303. [At] **It is estimated that at** the time of initial planting, Jefts and other farmers need about 54,000 gallons of water per acre per day. This may be required for more than one day, but may also be spread out over a number of days. To emphasize, the 54,000 gallons is not needed for the already growing or cultivating acres, only the acres proposed to being planted. (Jefts Tr. 2/27/96 at 47, lines 18-25; at 48, lines 1-25; at 49, lines 1-3). [KSBE FOF625]

## 2) Alec Sou

304. Sou started tilling the Kunia lands last November **(1994)** and began their first trial planting a couple of months later. (Sou Tr. 12/13/95 at 33, lines 16-18). They are committed to developing a large diversified agricultural farm in Central Oahu because they believe the farm future is in Central Oahu. (Sou Tr. 12/13/95 at 33, lines 19-25). Their strong belief in this can be shown by the creation of their family business in Central Oahu which required substantial commitment: baseyard construction took several months, soil amendments to the low pH, they are starting trials on new crops, and all the grounds are currently under cultivation. (Sou Tr. 12/13/95 at 34, lines 10-21). [KSBE FOF632]

305. Sou acquired a license with the Robinson Trust for 423 acres, of which approximately 386 are tillable; and with Nihonkai Leasing Company for 201 acres, of which approximately 185 acres are tillable. (Sou Tr. 12/13/95 at 33, line 25; Tr. 12/13/95 at 34, lines 1-2). [KSBE FOF633]

306. Forty-seven (47) cents was the drop dead price level for water that they determined after doing an analysis for multiple crops. Some crops require more, while some require less to be successful. According to Sou, the 47 cents, which was proposed to Robinson and Nihonkai in the negotiations, was determined through analyzing multiple crops, especially looking at the major commodity they would pursue. (Sou Tr. 12/13/95 at 45, lines 19-25; Tr. 12/13/95 at 46, lines 1-2, 3-12; at 47, lines 7-9). [KSBE FOF635]

307. All of Sou's lands that he has leased and licensed **[has] have** been served and irrigated by the Waiahole Ditch water for many years. (Sou Tr. 12/13/95 at 35, 17-21). [KSBE FOF637]

308. While Sou may not necessarily have an actual market at the time he puts in



the crop, they have great confidence in the relationships they have built with the retail market over the last fifteen (15) years because it has worked so far. (Sou Tr. 12/13/95 at 40, 21-22; Tr. 12/13/95 at 41, lines 1-7). [KSBE FOF639]

309. Generally, Sou likes to shoot for about a twenty percent (20%) profit margin. (Sou Tr. 12/13/95 at 49, 16-19). In the past, the **[proportion] percentage** of his costs **[towards] due to** water has ranged from five (5) to seven (7) **percent**, with the new crops taking higher numbers. It is higher with the new crops because the soil at Kunia is almost four (4) times more well-drained than the soil at Waianae. On the other hand, his other costs are fairly fixed. (Sou Tr. 12/13/95 at 50, lines 7-9, 13-14, 21-25; at 51, line 1). [KSBE FOF640]

310. At any one point, the maximum they have in actual crop on ground is one-third (1/3rd) of their land, while the other two-thirds (2/3rds) is in various stages of harvest, plow down and arid aeration to disrupt insect buildups. (Sou Tr. 12/13/95 at 34, lines 21-25). [KSBE FOF641]

311. Sou produces a variety of crops which require a diverse cultivating process, each with a different range of water needs and each requiring a different delivery system. For example, Sou's pump cost is 7.5 to 8 cents per thousand gallons. His water demand is a minimum flow average of 1,800 gallons per day to a maximum **flow average** of **[54,000] 5,400** gallons per day. Therefore, a comfortable amount for their plan would be 3,500 gallons per acre per day. (Sou Tr. 12/13/95 at 36, lines 1-4, 11-14, 21-25). [KSBE FOF642]

312. As an initial, one-time need, he requires 54,000 gallons per acre per day for the initial watering of two (2) inches. (Sou Tr. 12/13/95 at 37, lines 6-8, 15-17). Then, he drops it to ten (10) **thousand gallons per day** and then to six (6) **thousand gallons per day** in the actual planting cycle. The **[54,000] 5,400** gallons per acre per day applies to the high season, so it is a high average. (Sou Tr. 12/13/95 at 37, lines 19-20, 23-24; Tr. 12/13/95 at 38, lines 1-3). [KSBE FOF643]

313. However, some of their high value crops do not require a high water rate, and other major crops like lettuce cannot afford the high price range. Crops of high value that could afford a water rate greater than 47 cents include an intensive crop plan using minimum fallow ground, and some high value herbs like cilantro which generally does not require a lot except in certain seasons. (Sou Tr. 12/13/95 at 46, lines 16-25; Id. at 47, lines 1-2). [KSBE FOF644]

314. Sou definitely agrees that some sort of planning is needed between him and the other planters to make sure that the water is available for planting when high water use is needed. (Sou Tr. 12/13/95 at 38, lines 18-25; at 39, lines 1-3). [KSBE FOF645]

315. With respect to the issue of maximum quantity and planning with other farmers, Sou believes that they would generally have to rely on WIC to determine

how much water is available for each farmer. (Sou Tr. 12/13/95 at 41, lines 10-22). [KSBE FOF646]

**3) Huliwai Tropical Plantations, Limited**

316. The Huliwai Tropical Plantations, Limited (hereinafter "Huliwai") is a diversified plantation. Its operations include, but are not limited to, **[the]** crop selection, land preparation, water system installation, maintenance, and planting. (Wriston Tr. 12/13/95 at 22, lines 10-11, 21-25; at 30, lines 10-13). [KSBE FOF647]

317. Huliwai received a license from the Robinson Estate for a fifteen (15) year period. It plans to develop a tropical fruit tree orchard. Huliwai also wants to cultivate other diversified agriculture crops that would produce a quicker return. It is still in the planning stage on all of its' proposed projects. (Wriston Tr. 12/13/95 at 23, lines 1-7, 13-14; at 30, lines 21-23). [KSBE FOF648]

318. Specifically, Huliwai hopes to establish an asparagus farm. It is also interested in creating a joint venture with experienced taro and papaya farmers. However, these farmers are unwilling to commit to any sort of plan as long as water availability is uncertain. (Wriston Tr. 12/13/95 at 23, lines 7-14; at 28, lines 6-9). [KSBE FOF649]

319. If Huliwai could secure a water source, it would be able to begin cultivating its crops within a month's time. Fruit trees would then be able to be harvested in four (4) years. The asparagus crops would be ready for harvesting within nine (9) months of planting. Furthermore, the other vegetables would yield a return in less than a year. Therefore, the fifteen (15) year license gives the company an adequate amount of time to harvest and yield a return on all of the proposed crops. (Wriston Tr. 12/13/95 at 24, lines 7-8, 12-17; at 25, lines 21-25; at 26, lines 1-4). [KSBE FOF650]

320. Huliwai projects that it cannot profit as a business if it is unable to obtain Waiahole Ditch water for less than 40 cents a gallon. It based this estimate upon information secured from past research and previous discussions with other farmers. (Wriston Tr. 12/13/95 at 24, lines 20-25; at 25, lines 1-16). [KSBE FOF651]

321. Huliwai would be paying around 35 cents per thousand gallons for water. A great rise in elevation exists between the areas that need to be watered and the ditch in which the pump is located. Therefore, the cost to pump water from the ditch to the field will prove to be rather expensive. With these extra costs for pumping and for pipe irrigation, Huliwai's water costs will be higher than what the initial water cost per gallon is. (Wriston Tr. 12/13/95 at 25; lines 6-9; at 28, 10-11, 14-18). [KSBE FOF652]

322. Huliwai refuses to invest any more money into the company until it can be

certain that the water situation is stable. It cannot proceed in its diversified agriculture plans while the water supply remains inadequate. (Wriston Tr. 12/13/95 at 28, line 25; at 29, lines 1-2; at 30, lines 18-20). [KSBE FOF653]

**4) Eiko Nakama**

323. Eiko Nakama and his wife, Charlene (collectively "Nakamas") farm forty (40) acres of Robinson Estate land in Mililani. The parcel they cultivate is often referred to as the "banana patch parcel". (Nakama Tr. 12/13/95 at 13, lines 7-9; at 14, lines 5-8) The Nakamas' farm their land by themselves and have been farming for approximately nine (9) years. (Nakama Tr. 12/13/95 at 14, lines 9-11). [KSBE FOF654]

324. When time permits, the Nakamas also plant small crops of broccoli, zucchini, and cucumber. (Nakama Tr. 12/13/95 at 15, lines 2-9). [KSBE FOF655]

325. Dole/Castle & Cooke property surrounds the Nakamas' parcel. Consequently, their water comes from the Dole/Castle & Cooke System. (Nakama Tr. 12/13/95 at 14, lines 11-14). [KSBE FOF656]

326. The Nakama's land sits on the highest point of elevation of the surrounding properties. Since much of the water is being used on the lower lands, the Nakama's often do not receive an adequate supply of water for their crops. (Nakama Tr. 12/13/95 at 14, lines 14-18). [KSBE FOF657]

327. The lack of water supply has caused between fifty (50) and seventy-five (75) percent of the Nakama's plants to die. The Nakamas have done their best to salvage as much production as possible. Therefore, they have still managed to pay their bills despite the current water problem. (Nakama Tr. 12/13/95 at 14, lines 19-25). [KSBE FOF659]

328. Nakamas have varied the times of the day that he watered his crops in an effort to improve the situation. However, the water pressure was always greatest during the weekends and early mornings. (Nakama Tr. 12/13/95 at 18, lines 23-25; at 19, lines 1-11). [KSBE FOF660]

**c. Dole/Castle & Cooke**

329. Dole/Castle & Cooke continues to supply two (2) **[companies] businesses** they formerly owned with water: the Mililani Memorial Cemetery and the Mililani Golf Course. (Kaku Tr. 12/13/95 at 59, lines 1- 5). Dole/Castle & Cooke's Koa and Gentry fields are currently in pineapple cultivation. (Kaku Tr. 12/13/95 at 59, lines 6-8). [KSBE FOF697]

330. A separate water contract **[existed] exists** between Dole/Castle & Cooke and WIC which entitled Dole/Castle & Cooke to purchase approximately 4.8 million

gallons of Waiahole Ditch water per day as needed. (Chong Tr. 1/10/96 at 158, lines 7-11). [KSBE FOF698]

331. Dole/Castle & Cooke has undergone reorganization, the details of which are worked out but not yet finalized in writing. (Chong Tr. 1/10/96 at 159, lines 12-14). Dole/Castle & Cooke is not paying lease rent on any land that it is managing. (Chong Tr. 1/10/96 at 160, lines 16-17) **[nor] Nor** is it paying lease rent for lands used for its pineapple production. (Chong Tr. 1/10/96 at 160, lines 10-11). Pending the results of reorganization, Dole/Castle & Cooke intends to keep its lands **currently receiving water from the Waiahole Ditch** in agricultural production. (Chong Tr. 1/10/96 at 161, lines 12-20). [KSBE FOF699, WIC FOF195]

332. Moreover, ninety-seven (97) acres of their land is leased to Zeune Baccam and has been in diversified agriculture since 1985. Baccam uses about one (1) to ten (10) acres for his own farming use and subleases the rest to small farming families. Baccam has a twenty (20) year lease with Dole/Castle & Cooke ending in the year 2005, paying \$400 per acre per year and **currently paying** 25 cents per thousand gallons for water. (Kaku Tr. 12/13/95 at 59, lines 11- 15; at 68, lines 7-16). [KSBE FOF700]

333. In August 1992, Dole/Castle & Cooke leased a small twenty-three (23) acre piece to Pacific Landscape Corporation ("PLC"), a small nursery operation owned and operated by Solomon Wainee and his family. However, Dole/Castle & Cooke's largest diversified agriculture farmer is Hawaiian Foliage and Landscape ("Hawaiian Foliage") which leases about 468 acres, including forty (40) acres buffer zone. (Kaku Tr. 12/13/95 at 59, lines 16-23; at 63, lines 8-12). Hawaiian Foliage's own lease is a fifteen (15) year term ending in the year 2007. Lessor is entitled to terminate the lease due to non-payment of rent, or if they are in default (nonconformance). (Kaku Tr. 12/13/95 at 65, lines 1-3, 12-15). (Kaku Tr. 12/13/95 at 63, lines 16-20; Tr. 12/13/95 at 64, lines 1-6). [KSBE FOF701]

334. Hawaiian Foliage, in their own use, grow golf course grass and plant trees for their nursery. On the other hand, most of their diversified lands are leased to small farming families that grow a wide range of crops like cucumber, long beans, peanuts, squash, herbs, etc. They **(Dole/Castle & Cooke)** are currently requesting an allocation of 2.7 million gallons of water to supply their current users. (Kaku Tr. 12/13/95 at 59, lines 24-25; at 60, lines 1-10, 13-16). [KSBE FOF703]

335. Furthermore, the lease with Hawaiian Foliage specifies that they will be supplied with water at the rate of 22.9 cents per thousand gallons, and that the source of water is the Waiahole Ditch system. (Kaku Tr. 12/13/95 at 65, lines 19-23; at 66, lines 3-6). [KSBE FOF704]

336. PLC leases about twenty-three (23) acres of land, paying \$450 per acre per year, with a lease term of fifteen (15) years expiring in 2007. At least ninety-five percent (95%) of the twenty-three (23) acres are usable. Furthermore, Dole/Castle

& Cooke agreed to provide PLC with water at a **current** rate of 25 cents per thousand gallons. (Kaku Tr. 12/13/95 at 66, lines 7-23). [KSBE FOF705]

337. One thing new to the market is that in one area, the farmers are growing ethnic foods; farmers are encouraged to develop and commercially grow these things for supermarkets or for export. For example, one person with forty-two (42) acres grows herbs for export to Canada and mainland United States. (Nitta Tr. 12/13/95 at 71, lines 3- 6, 7-11). [KSBE FOF706]

## **1) Pacific Landscape Corporation**

338. Solomon Wainee is the owner and president of Pacific Landscape Corporation ("PLC"). PLC leases twenty-two (22) acres in the Mililani area from Dole/Castle & Cooke under a fifteen (15) year lease term dating from 1992; he pays \$2600 per quarter for the twenty-two (22) acres. PLC is a landscape contractor that installs plants and irrigation systems primarily for commercial use. This includes planting trees, shrubs, and field stock items, mainly for PLC's own projects such as the Halekoa Hotel and Kalaniana'ole Highway and occasionally selling to other contractors. (Wainee Tr. 12/14/95 at 6, lines 14-25; at 7, lines 1-3; at 12, lines 21-25). PLC is a family-run operation that also employs fourteen (14) to eighteen (18) other people. (Wainee Tr. 12/14/95 at 8, lines 1-3). [KSBE FOF707]

339. PLC uses about 100,000 gallons of water per month, efficiently using drip irrigation. The company currently has fourteen (14) acres in various trees, shrubs, and field stocks, but it is having a difficult time maintaining the fourteen (14) acres because of the significant drop off in Waiahole Ditch water since December 1994. Since the water has been taken away from the ditch, water is often not available to PLC. PLC's location on higher ground affects its receipt of water because the Waiahole water works through gravity flow without pumps or the like so that when all the people on lower ground turn on the water, there is not enough to supply the higher ground. If sufficient water were available, PLC would plant another four (4) to six (6) acres and would even consider using some of the land for diversified agriculture. (Wainee Tr. 12/14/95 at 7, lines 4-25). PLC's lease with Dole/Castle & Cooke basically allows it to plant anything on the property. (Wainee Tr. 12/14/95 at 11, lines 3-8). [KSBE FOF708]

340. PLC waters about three (3) times a week and it is usually an all-day event. But, because of the water shortage, PLC has been watering four (4) to five (5) times a week instead, from six (6) to ten (10) in the morning when there is enough water pressure for a flow before all the farmers turn on their water. (Wainee Tr. 12/14/95 at 9, lines 19-25; at 10, lines 1-8; at 13, lines 18-21). [KSBE FOF711]

## **2) Hawaiian Foliage and Landscape**

341. Hawaiian Foliage and Landscape ("Hawaiian Foliage") is a landscaping company located on property owned by Dole/Castle & Cooke in the Waiahole Ditch

footprint. The property is used to grow plants for landscaping (Keahi Tr. 12/20/95 at 90, lines 18-21). [KSBE FOF712]

342. Hawaiian Foliage leases 468 acres of land, one hundred (100) of which is used for growing landscaping plants and shrubs. The lease will expire on December 31, 2007. The annual rent is \$5,879, which increases forty-five percent (45%) every three (3) years. (Keahi Tr. 12/20/95 at 93, lines 6-21). It is unclear whether Dole/Castle & Cooke charges Hawaiian Foliage for water. (Keahi Tr. 12/20/95 at 93, lines 22-24). [KSBE FOF713]

343. However, Sean Keahi's sublease with Hawaiian Foliage to grow taro calls for him only to pay for the water at a price of thirty cents per thousand gallons. He does not pay for the land so long as he grows taro for cultural purposes. Once he grows taro for commercial purposes, he must pay rent. (Keahi Tr. 12/20/95 at 94, lines 11-17). Hawaiian Foliage subleases to two (2) other persons, Wally Nitta and Thinh Quang. (Keahi Tr. 12/20/95 at 94, lines 24-25). **[Mr. Nitta about ninety-eight (98) acres. (Keahi Tr. 12/20/95 at 95, lines 2-3).]** [KSBE FOF714]

### **3) Nitta**

344. Nitta has a fifteen (15) year lease and he subleases to farm[s] families for also fifteen (15) years. (Nitta Tr. 12/13/95 at 78, lines 8-16). Nitta charges his older sublessees \$75 per acre per month and new sublessees \$100 per acre per month, while he pays \$50 **[per year]** per acre per month. In total, there are 147 acres at the \$75 rate and a little over **[200] 50** acres at the \$100 rate. (Nitta Tr. 12/13/95 at 79, lines 1-14). He charges his sublessees 30 cents per thousand gallons of water, while he in turn pays Hawaiian Foliage 30 cents per thousand. (Nitta Tr. 12/13/95 at 80, lines 13-18). [KSBE FOF715]

345. Part of Nitta's property lies on prime agricultural land due to their geographic location which experiences very long sunlight contributing to the growth of their plants and vegetables. Moreover, the area is also relatively cool without an abundance of rainfall which can hamper the growing crops; this way, they rely more on the irrigation system instead of just depending on rain water for their diversified crops. (Nitta Tr. 12/13/95 at 71, lines 12-24). [KSBE FOF716]

346. **[There] Wallace Nitta testified that there** are probably about one hundred (100) families working on the property, even if they do not have contracts with all of them. Many of these farmers were displaced or lost their job in construction, hotel work, or another industry and are trying to derive income without resorting to welfare or food stamps. Many of them get their relatives involved including the children to keep them out of trouble after school. (Nitta Tr. 12/13/95 at 71, lines 2-5; at 72, lines 2-16). [KSBE FOF717]

347. After researching the problem, Nitta found that the quality of water before reaching the Mililani Golf Course was excellent, but **became** very poor once it

reached Mililani. They found a lot of garbage in the area because of people dumping things in after yard cleaning, dead dogs, etc. Also, they often received only 1,000 gallons of water per minute instead of the 2,000 gallons per minute capacity because of clogging due to the poor filtration system. However, since they redesigned the filtering system, the water quality has improved a lot, as well as the shortage problem. (Nitta Tr. 12/13/95 at 72, lines 17-25; at 73, lines 4-8, 12-19, 21-25; at 74, lines 6-8, 18-19). [KSBE FOF718]

348. The other factor in the water problem was due to the demand for water being so high at certain times, depending on the month and on the crop. To help control the water, they are working with Dole/Castle & Cooke to set-up a reservoir in the area as a long-range plan to alleviate the problems. (Nitta Tr. 12/13/95 at 75, lines 2-6, 7-22). The reservoir they hope to build will have a capacity of 2 to 5 million gallons, depending on what would be economical. (Nitta Tr. 12/13/95 at 81, lines 2-5). [KSBE FOF719]

349. Nitta clarifies that they maintain constant contact with Dole/Castle & Cooke to help Dole/Castle & Cooke solve the water problems (e.g. filtration problems), although the farmers themselves would be willing to do it because it would help their operations. (Nitta Tr. 12/13/95 at 77, lines 20-25; Tr. 12/13/95 at 78, lines 7-16). [KSBE FOF720]

#### 4) Baccam

350. Zeune Baccam ("Baccam") leases ninety-seven (97) acres of farmland from Dole/Castle & Cooke. This land is located between half a mile and a mile away from the Lanikuhana and Meheula intersection. (Baccam Tr. 11/15/95 at 40, lines 4-5, 22-23; at 39, lines 8-15). [KSBE FOF721]

351. This twenty (20) year lease began in 1985 with an organization known as Hawaii Agricultural Operations. Baccam took over this lease with ten (10) years and a debt of \$296,000 remaining on it. He pays \$400 per acre **per year** on his lease to Dole/Castle & Cooke. (Baccam Tr. 11/15/95 at 40, lines 4-6, 12-13; at 53, lines 9-13; at 52, lines 1-2). [KSBE FOF722]

352. Baccam's lease cannot be terminated as long as the tenant uses the land for farming. Also, if the tenant stops farming he must give Dole/Castle & Cooke three (3) months advance notice in order to cancel the lease. (Baccam Tr. 11/15/95 at 52, lines 9-12; at 53, lines 1, 3-7). [KSBE FOF723]

353. Baccam grows diversified agriculture products on approximately five (5) acres of his land. At one time, Baccam cultivated all ninety-seven (97) acres. However, in 1991 he began to sublease some of his land to other farmers. Baccam is leasing twenty-nine (29) plots to his subtenants. Each plot consists of three (3) acres. The subtenants renew their leases **[ever] every** three (3) years and pay \$400 **per month** per plot. Baccam and his subtenants share the costs for the water rent and the

equipment. (Baccam Tr. 11/15/95 at 40, lines 7-10; at 57, lines 15-20; at 58, lines 7-13; ~~at 61, lines 2-5~~; at 68, lines 20-23). [KSBE FOF724]

354. Generally, fifty (50) of Baccam's ninety-seven (97) acres are cultivated at any one moment. The rest of the acres must be kept open to maintain the soil. (Baccam Tr. 11/15/95 at 64, lines 16-22). [KSBE FOF725]

355. The farmers and their families depend on this farming to make a living. Usually, the entire family shares in the farm work. These twenty-five (25) families, approximately one hundred (100) people, raise a wide variety of vegetables such as bok choy, kai choy, green onions, chinese parsley, chinese daikon, korean daikon, eggplant, long beans, string beans, basil, soybeans, wing beans, tomatoes, mint, japanese cucumber, herbs, taro, sequal, lemon grass and many other products. (Baccam Tr. 11/15/95 at 40, lines 19-25, at 41, lines 1-3). The farmers produce about four (4) crop cycles per year. (Baccam Tr. 11/15/95 at 60, lines 21-22). [KSBE FOF726]

356. The farmers have various markets in which they sell these vegetables. A strong demand exists for the products. Ever since he began growing diversified agriculture under this lease, Baccam has successfully marketed his stock. (Baccam Tr. 11/15/95 at 41, lines 4-5, 9-11). [KSBE FOF728]

357. Baccam pays Dole/Castle & Cooke separately for his water. The water that Dole/Castle & Cooke provides comes from the Waiahole Ditch system and **currently** costs 25.4 cents per every thousand gallons. (Baccam Tr. 11/15/95 at 40, lines 13-15; at 55, line 25; at 56, lines 1-3). [KSBE FOF731]

358. Baccam's lease is conditioned upon his having continuous access to the Waiahole water. (Baccam Tr. 11/15/95 at 56, lines 16-21). [KSBE FOF735]

359. Baccam and his farmers usually meet once a month, or once every two (2) months to discuss the kinds of crops they should plant, the marketing strategy of these crops, and the consumption of water. (Baccam Tr. 11/15/95 at 61, lines 21-25; at 62, lines 1, 25; at 63, lines 1-5). [KSBE FOF736]

## **5) Mililani Golf Club**

360. Mililani Golf Club was developed in 1967 by Castle & Cooke. Sports Shinko Mililani Company, Limited (hereinafter "Sports Shinko") then purchased it from Dole/Castle & Cooke in 1986. As part of the purchase, Dole/Castle & Cooke agreed to supply Waiahole Ditch water to irrigate the 165 acres of land. (Nishida Tr. 12/13/95 at 82, lines 24-25; at 83, lines 16-19, 22-24). [KSBE FOF770]

361. Mililani Golf Club uses between 200,000 and 500,000 gallons of water per day. It uses less water in the winter and more in the summer. (Nishida Tr. 12/13/95 at 84, lines 13-19). [KSBE FOF772]



362. As a result of the purchase of the golf course, Dole/Castle & Cooke and Sports Shinko agreed that as long as the Waiahole Ditch provided water, Dole/Castle & Cooke would supply water for the irrigation of the golf course. Sports Shinko **currently** pays 75 cents per thousand gallons for its water. (Nishida Tr. 12/13/95 at 85, lines 11-23; at 86, lines 2-4). [KSBE FOF774]

363. Sport Shinko's total expense for irrigation water will be approximately \$60,000 for 1996. (Nishida Tr. at 12/13/96 at 92, lines 1-25; at 93, lines 1-3) [KSBE FOF775]

## **6) Mililani Memorial Park**

364. Mililani Group, Inc. ("Mililani Group") is currently doing business under the name of Mililani Memorial Park, which was developed by Dole/Castle & Cooke in 1960. The present funeral home and cemetery has been drawing water from the Waiahole Ditch for all its water needs since it began operation in 1963. (Kuwasaki Tr. 12/13/95 at 93, lines 20-21; at 94, lines 7-10, 21-25). [KSBE FOF858]

365. In 1974, a group of investors purchased Mililani Memorial Park from Dole/Castle & Cooke with an agreement that Dole/Castle & Cooke would continue to supply water from the Waiahole Ditch system to Mililani Group for the use of the cemetery and mortuary operations. **[The] Rex Kuwasaki testified that the** purchase of the mortuary, funeral, chapel facility and cemetery lands required a substantial monetary investment. (Kuwasaki Tr. 12/13/95 at 95, lines 5-9, 19-21). [KSBE FOF859]

366. Through a contract, Dole/Castle & Cooke has been acquiring water from OSCO and Waiahole Water Company or WIC and is now applying for a **[reuse] water use** permit which includes Mililani Group's request for continued use of Waiahole Ditch water. (Kuwasaki Tr. 12/13/95 at 95, lines 10-15). [KSBE FOF860]

367. Mililani Group has made numerous additions and developments which all support their continued need for water. For example, an additional 8.6 acres was purchased for cemetery lands in 1981, an additional 8.5 acres of cemetery plots was developed in 1987, a second chapel and mortuary **[was] were** developed in 1991, and they expect to develop an additional ninety (90) acres. **[Hence,] Rex Kuwasaki testified that** Mililani Group has made a substantial investment and water from Waiahole Ditch system is required to continue its business of providing funeral services to memorialize deceased persons. (Kuwasaki Tr. 12/13/95 at 95, lines 22-25; Tr. 12/13/95 at 96, lines 1-13). [KSBE FOF861]

368. Mililani Group has forty-five (45) employees and about fifty-five (55) sales counselors to market the product and services of the company. In performing this necessary community function, Mililani has handled about 1,200 funerals and 666 burials annually, and has sold more than 54,500 plots to more than 5,500 families.

They have also contracted with over 25,000 individuals for funeral services at their death at a prearranged price. Because Hawaii law requires the perpetual maintenance of cemetery lands, a trust fund has even been established to provide for the maintenance of this necessary park. (Kuwasaki Tr. 12/13/95 at 96, lines 11-25; at 97, lines 1-2). [KSBE FOF862]

369. One of their concerns is the increased need for water in the future. As public need for cemetery plots **[have] has** grown and they have developed more plots, their monthly water usage has increased to about five (5) million gallons per month. (Kuwasaki Tr. 12/13/95 at 98, lines 1-8). For example, last month's water bill was \$104 per million gallons per month which they have to pay to Dole/Castle & Cooke. (Kuwasaki Tr. 12/13/95 at 101, lines 18-21; Tr. 12/13/95 at 102, lines 1-2). [KSBE FOF863]

370. Furthermore, while they have not made an attempt to determine the potential for using treated wastewater for irrigation, it is currently not an option for them as there **[are] is** no **reclaimed** effluent **[type of water]** near their development. (Kuwasaki Tr. 12/13/95 at 102, lines 3-11). [KSBE FOF865]

371. Although their purchase agreement in 1974 provided that Dole/Castle & Cooke would not supply them with more than 250,000 gallons of water, they now expect to pass that limit as they did not foresee such an increased demand. (Kuwasaki Tr. 12/13/95 at 99, lines 10-25). (Kuwasaki Tr. 12/13/95 at 99; at 100, lines 8-14). (Kuwasaki Tr. 12/13/95 at 100, lines 21-15; Tr. 12/13/95 at 101, line 2). [KSBE FOF867]

**d. WIC**

372. In its October 2, 1995 "clarification letter", the Joint Applicants added 2 mgd as "a recognition of system losses as a use". 10/2/95 Clarification Letter. [CWRM FOF8]

**e. DOA Ag Park**

373. The DOA has applied for 0.75 mgd of Waiahole Ditch water to irrigate 150 acres. 10/2/95 Clarification Letter. [WIC FOF154]

**f.** Royal Oahu Resort (Note: Royal Oahu Resort, Inc., by letter dated April 11, 1997, withdrew its application for a water use permit. Royal Oahu has completed and is now drawing water from its on-site well (Well No. 2401-07). Royal Oahu's application is therefore moot.)

374. The ROR Golf Course is currently in receivership. The court-appointed receiver of the ROR Golf Course is Howard H. Hamamoto. Hamamoto, Tr., 12/21/95, P13/L19-21. [ROR FOF5]

375. The ROR Golf Course is a 163.3-acre site and is located near the Royal Kunia Subdivision in Central Oahu. Its tax map key no. is 9-4-2:46. Affidavit of Howard H. Hamamoto filed June 28, 1995, ¶¶1-2; Ex. X-6. [ROR FOF6]

376. The property on which the ROR Golf Course sits ("Subject Property") was originally owned by the Robinson Estate. The Subject Property was purchased by Halekua Development Corporation ("Halekua") from the Robinson Estate in 1986 and subsequently purchased by ROR for the purpose of developing and operating a golf course. ROR acquired a 99% interest in the Subject Property in 1989 and Halekua's remaining 1% interest in 1993. Affidavit of Howard H. Hamamoto filed June 28, 1995, ¶3; Hamamoto, Tr., 12/21/95, P14/L1-16; Ex. X-7, X-8 and X-9. [ROR FOF7]

377. When it was owned by Robinson Estate, the Subject Property was leased to Oahu Sugar Company, Ltd. ("OSCo") and planted in sugar cane. Affidavit of Bert L. Hatton filed June 28, 1995, ¶¶3-4. [ROR FOF8]

378. OSCo continued to grow sugar cane on various areas within the Subject Property through 1990. Affidavit of Bert L. Hatton filed June 28, 1995, ¶5. Sugar cane production was phased out in anticipation of the commencement of golf course construction. Hatton, Tr., 7/24/95, P44/L5-13. [ROR FOF9]

379. The average amount of water **pumped and/or** taken **from Waiahole Ditch** for sugar cane production on the Subject Property by OSCo **[was] is estimated to have been** between 7,000 and 8,000 gallons per acre per day. Hatton, Tr., 7/24/95, P45/L2-7. [ROR FOF10]

380. Historically, the Subject Property has been irrigated with water developed in the Waiahole Ditch System, supplemented periodically by pump water generated with electricity provided by OSCo's sugar mill when OSCo was still in operation. With the closing of the sugar mill, the pump water is not presently available. Affidavit of Howard H. Hamamoto filed September 18, 1995, ¶12. [ROR FOF11]

381. County and state land use maps were re-designated in 1989 and 1990, and the Subject Property was rezoned in 1991 so that a golf course could be developed. Affidavit of Howard H. Hamamoto filed June 28, 1995, ¶4; Ex. X-20, X-21 and X-26. [ROR FOF12]

382. After the plans were completed, a grading permit to commence construction of the ROR Golf Course was obtained in March of 1992. Construction began on or about May 27, 1992. From the first day of construction, the ROR Golf Course took water from the Waiahole Ditch system. Affidavit of Rick Montgomery filed June 28, 1995, ¶3-4; Ex. X-1, X-2, X-11 and X-12. [ROR FOF14]

383. The amount of water taken for the ROR Golf Course gradually increased as construction progressed. During the early phases of construction, the ROR Golf

Course took approximately 24,000 to 40,000 gallons per day for dust control purposes. The amount increased to approximately 100,000 gallons per day or 2.5 gallons per month by late 1992, and between 269,000 to 1.4 million gallons of water per day or approximately 655,000 gallons per day by November 1994. Affidavit of Rick Montgomery filed June 28, 1995, 5-6; Ex. X-3 and X-4. [ROR FOF15]

384. The Commission concluded during the hearings on existing uses in June and July, 1995, that ROR was using 4,800 gpd of Waiahole water for dust control during the construction of the golf course on July 15, 1992. Order Number 8, August 15, 1995. [CWRM FOF9]

385. The Subject Property has been and is currently receiving water from the same system that irrigated the Subject Property when OSCo grew sugar cane. Affidavit of Bert L. Hatton filed June 28, 1995, ¶9. [ROR FOF16]

386. The ROR Golf Course was substantially completed on October 27, 1993. The temporary clubhouse and other buildings for the ROR Golf Course were substantially completed by early spring of 1995. Affidavit of Rick Montgomery filed June 28, 1995, ¶7; Ex. X-5. [ROR FOF17]

387. The Subject Property was purchased by ROR for \$33 million. Approximately \$87 million has been spent and/or committed into the development, construction and operation of the ROR Golf Course. Affidavit of Howard Hamamoto filed September 18, 1995, ¶8. [ROR FOF18]

388. The amount necessary to irrigate the ROR Golf Course, given its location and weather conditions, varies from 300,000 to 1.3 million gallons per day, or an average of .75 mgd. To continue to remain viable, **it is estimated that** the ROR Golf Course needs **[an allocation of]** an average of .75 mgd. Hamamoto, Tr., 12/21/95, P15/L1-8. [ROR FOF19]

389. Water usage on the ROR Golf Course is carefully monitored by way of a sophisticated weather system that measures evaporation rates on a daily basis and signals to controllers through the ROR Golf Course when water needs to be replaced. **[This] Howard Hamamoto testified that the** system insures that the ROR Golf Course is not over-irrigated and that water is not wasted. Affidavit of Howard H. Hamamoto filed September 18, 1995, ¶10. [ROR FOF20]

390. The ROR Golf Course also has in place a Best Management Plan, which outlines procedures and guidelines for water management and management of fertilizers and pesticides. The practices and guidelines outlined in the Best Management Plan were developed specifically for the ROR Golf Course. Wong, Tr., 2/29/96, P19/L16-20; Ex. X-23. [ROR FOF21]

391. Other steps taken by the ROR Golf Course to insure proper water management and proper control and management of fertilizer and pesticide use

include the following: installation of two groundwater monitoring wells, which monitor changes to the groundwater that may be caused by the ROR Golf Course's use of fertilizer, pesticides and herbicides; installation of six vadose zone lysimeters to detect agricultural chemicals that may infiltrate into the soil above the groundwater; and use of slow-release fertilizers to avoid leaching and contamination of groundwater sources. Wong, Tr., 2/29/96, P19/L21-25, P20/L1-7; Ex. X-17 and X-18. [ROR FOF22]

392. The use of nonpotable Waiahole Ditch water for golf course irrigation is consistent with State land use plans and policies. Pai, Tr., 11/28/95, P15/L9-25, P16/L1-4. And all of the applications for Waiahole Ditch water, including ROR Golf Course's application, are consistent with the Hawaii State Plan. Pai, Tr., 11/28/95, P28/L8-25, P29/L1-20. [ROR FOF24]

393. The ROR Golf Course is classified within the State Land Use Urban District. Ex. X-26. The Golf Course is consistent with that land use designation. Kobayashi, Tr., 12/20/95, P154/L1-4. [ROR FOF25]

394. The ROR Golf Course is consistent with State land use plans and planning objectives. Affidavit of Howard H. Hamamoto filed September 18, 1995, ¶6; Exhibit X-26. [ROR FOF26]

395. The ROR Golf Course presently employs 23 employees or approximately .15 jobs per acre. That is pre-opening of the ROR Golf Course. After it is in full operation, the ROR Golf Course is expected to eventually generate up to 80 jobs, or approximately .49 jobs per acre, consistent with the Hawaii State Plan's priority to support a growing, stable economy. Hamamoto, Tr., 3/7/96, P153/L12-17, P156/7-17. [ROR FOF30]

396. All of the applications for Waiahole Ditch water, including ROR Golf Course's application, are consistent with the General Plan of the City and County of Honolulu. Soon, Tr., 11/14/95, P71/L24-25, P72/L1. [ROR FOF32]

397. The use of Waiahole Ditch water for golf course irrigation is consistent with City and County of Honolulu's Development Plans. Ukishima, Tr., 11/15/95, P37/L6-14. [ROR FOF34]

398. The ROR Golf Course, which was designated park, golf course, on the Central Oahu Land Use Map by the City Council, City and County of Honolulu, is consistent with that City and County of Honolulu land use designation in the Central Oahu Development Plan. Soon, Tr., 11/14/95, P74/L12-19, P82/L16-25, P83/L1-3; Ex. X-20. [ROR FOF35]

399. The ROR Golf Course is also consistent with the City and County of Honolulu's long range plans for Central Oahu, which are indicated in the July 1995 Central Oahu Development Plan Public Review Draft. Ukishima, Tr., 11/14/95,

P178/L1-5; Ex. X-25. [ROR FOF36]

400. The ROR Golf Course is part of the City's proposed open space concept for Central Oahu, which recognizes the aesthetic beauty and usefulness of open spaces. Ukishima, Tr., 11/14/95, P178/L6-25, P179/L1-16. [ROR FOF37]

401. As part of the Royal Kunia Master Community, the ROR Golf Course is also consistent with the City and County of Honolulu's proposed long-range plans for residential and urban development in the area. Ukishima, 11/14/95, P179/L20-24. [ROR FOF38]

402. Golf courses are beneficial to master-planned communities in the Central Oahu and Leeward communities because they serve as a good temporary detention basins for flooding situations. Ukishima, Tr., 11/14/95, P181/L5-20. [ROR FOF40]

403. The ROR Golf Course provides services and benefits to communities in Central Oahu. For example, it provides training and employment to OSCo displaced workers. In 1994 alone, the ROR Golf Course was one of the largest employers of displaced workers of OSCo and still employs many of those workers. As a result, the ROR Golf Course receives positive support from communities in Central Oahu. Wong, Tr., 2/29/96, P18/L24-25, P19/L1-11. [ROR FOF41]

404. The Golf Course cannot secure a withdrawal and transmission system at a cheaper expense, such as running a pipe along the Waikele Stream through Navy property, because Navy will not grant rights-of-way through its property since an alternative route is available. Hamamoto Tr., 3/7/96, P158/L17-22. [ROR FOF50]

405. Use of effluent above the H-1 freeway, where the ROR Golf Course is located, may compromise the Pearl Harbor aquifer. Groundwater in Pearl Harbor aquifer is an important drinking water source in Hawaii. Data from the Department of Health indicates that the Pearl Harbor aquifer is vulnerable to contamination from sewage effluent. Anderson, Tr., 2/1/96, P132/L10-18. Therefore, the use of effluent above the H-1 freeway, including use over the ROR Golf Course, may compromise the quality of the State's most important source of drinking water. Anderson, Tr., 2/1/96, P133/L19-23. [ROR FOF51]

406. The ROR Golf Course cannot use R-3 water under the DOH Guidelines. Wong, Tr., 2/29/96, P22/L18-19; Ex. L-400. [ROR FOF54]

407. Although R-1 water could theoretically be allowed under the DOH Guidelines, there are no treatment plants that are producing R-1 quality water on Central Oahu or anywhere else on Oahu, many restrictions would apply to the use of R-1 water over the Pearl Harbor aquifer, and it would be very expensive to treat and pump R-1 water. Anderson, Tr., 2/1/96, P133/L11-14, P188/L15-17. [ROR FOF56]

408. The Golf Course has not secured the necessary rights-of-way to transmit effluent from any of the nearby treatment facilities to the site. Hamamoto, Tr., 3/7/96, P157/L20-23. [ROR FOF60]

409. Although the Golf Course was granted an allocation by the COWRM for water from Waipahu Pump 2, that allocation is only the first step in a series of steps that have to be taken before use of the water becomes available. The Golf Course would have to obtain easements from three separate landowners and has not yet secured the water delivery agreements necessary to use water from the pump. There is also an infrastructure cost connected with that source. The Golf Course is faced with the cost of building another reservoir and renovating the dilapidated transmission system. The cost of rebuilding the infrastructure does not include the cost of electricity that the Golf Course will be charged to pump the water to the site. Hamamoto, Tr., 3/7/96, P157/L9-25, P158/L1, P159/L21-25, P160/L1. [ROR FOF61]

410. On June 5, 1996, the Commission approved the issuance of an interim water use permit to Howard H. Hamamoto for the reasonable and beneficial use of 0.6 mgd of potable ground water from the Waipahu-Waiawa Aquifer System for irrigation supply for the 151-acre (net irrigated acreage) Royal Oahu Resort Golf Course for Royal Oahu Well (Well No. 2401-07). The following special conditions were attached to the permit:

- a. Should an alternate permanent source of water be found for this use, then the Commission reserves the right to revoke this permit, after a hearing.
- b. Revoke the water use permit for WP 2 (Well Nos. 2301-27 to 32) for 0.75 mgd (WUP No. 419) upon issuance of a pump installation permit. [CWRM FOF10]

**g. Puu Makakilo**

411. The failure to include the **Puu Makakilo** Property or its then-owners by name as a secondary user in the June 14, 1994 amendment to the application was an oversight by WIC. (Hatton Tr., 6/29/95, P88-89). [PMI FOF6]

412. In a February 3, 1995 letter, Puu Makakilo, Inc. (PMI), a wholly owned subsidiary of Grace Pacific Corporation (Creps, 9/18/95, P2/L2-3), and the owner of the **Puu Makakilo** Property (E-24) requested use of 1.00 MGD of Waiahole Ditch water. [PMI FOF7]

413. In the October 2, 1995 "clarification letter" from the joint applicants, PMI modified its request from 1.0 mgd to 0.75 mgd. 10/2/95 Clarification Letter. [CWRM FOF11]

414. The Commission confirmed to WIC in a March 9, 1995 letter that the "multi-party water use permit application for Waiahole Ditch waters" had been accepted for further processing. [PMI FOF8]

415. The application was described in a notice to be published in a newspaper of general circulation in the City and County of Honolulu pursuant to HRS § 174C-42. [PMI FOF9]

416. The notice published on March 9 and 16, 1995 identified PMI as an applicant requesting use of 1.00 MGD of Waiahole Ditch water. [PMI FOF10]

417. On August 30, 1995 PMI filed its Motion for Reconsideration of Order No. 8 regarding the timeliness of PMI's application in light of the amendments of June 14, 1994 and October 24, 1994. [PMI FOF12]

418. The Commission denied PMI's Motion for Reconsideration on October 16, 1995 in Order No.10 but stated that PMI may apply as a new use under HRS §§ 174C-49, 51 to 53. [PMI FOF13]

419. By letter dated July 15, 1996, the Land Use Commission of the State of Hawaii advised the Commission that the location of the Makakilo Golf Course is within the State Land Use Agricultural District. [PMI FOF15]

420. At all relevant times herein, as it pertains to PMI's use of the **Puu Makakilo** Property for the Makakilo Golf Course, Ordinances of the City and County of Honolulu pertaining to the Ewa Development Plan provided for the construction of golf courses in Ewa. (S-2). [PMI FOF16]

421. PMI's Makakilo Golf Course is shown on the Ewa Development Plan Urban Land Use Map. (S-20, P4-39), is referenced in the Ewa Development Plan Report dated June 1995 (S-20) and is shown on the Ewa Development Plan Open Space Map therein. [PMI FOF19]

422. In the July 1995 Ewa Development Plan Public Review Draft, the City and County of Honolulu Planning Department includes the Makakilo Golf Course as a major component of the Ewa Green Space and Green Ways Network (S-6, P6-9, P38). [PMI FOF21]

423. **[More] It is believed that more** than 500,000 gallons of water a day are needed for irrigation purposes simply to prevent grass from dying. (Dewey Tr., 12/21/95, P77/L17-19). [PMI FOF27]

424. In 1988, Finance Realty, Inc., as agent for the Campbell Estate, applied for a Conditional Use Permit from the City and County of Honolulu to develop an 18-hole golf course and accessory buildings on the **Puu Makakilo** Property. (E-2, P1). [PMI FOF28]



425. On February 14, 1989, the Department of Land Utilization of the City and County of Honolulu issued a Conditional Use Permit for construction of the Makakilo Golf Course. (E-2). [PMI FOF29]

426. The City and County of Honolulu subsequently notified PMI that the Conditional Use Permit runs with the **Puu Makakilo** Property and is still in effect. (E-25; Dewey, 9/18/95, P8/L20-25, P9/L1-2). [PMI FOF30]

427. At the time of the issuance of the Conditional Use Permit:

The **Puu Makakilo** Property was zoned AG-2, General Agricultural District. (E-2, P1);

A golf course was a permitted use on property zoned AG-2, as an outdoor recreational facility. (E-2, P6; Dewey, 9/18/95, P9/L15-17); and

The **Puu Makakilo** Property was vacant and described as dry range land with a scrub-type vegetative cover. (E-2, P7, E-43, E-44; Dewey, 9/18/95, P9/L14-17). [PMI FOF31]

428. The terrain of the **Puu Makakilo** Property is hilly and varies in elevation with steep slopes not exceeding 30%. (E-2, P7; E-43; E-44; E-45). [PMI FOF32]

429. The **Puu Makakilo** Property has a Land Study Bureau overall productivity rating of "E," and has a poor productivity potential for most agricultural activities. (E-2, P5-9; Dewey, 9/18/95, P9/L13-15, P10/L8-9). [PMI FOF33]

430. There are currently residential zoned vacant lands bordering the **Puu Makakilo** Property. Any residential units built on these lands will likely command premium values when and if developed because of the views and open space created by the Makakilo Golf Course. (E-2, P10). [PMI FOF34]

431. Statistics from the Office of State Planning show that golf courses generate approximately .16 to .46 jobs per acre, or 29 to 82 jobs per 180 acres. By comparison, diversified agriculture generates only .08 jobs per acre or 8 jobs per 100 acres. (X-29). [PMI FOF37]

432. On October 25, 1990, in a series of Deeds, the Campbell Estate transferred title to the **Puu Makakilo** Property to T. G. World Exchange, Limited, who in turn conveyed it to Chiyoda Pacific, Inc. ('Chiyoda'). (E-3; E-4; E-5). [PMI FOF40]

433. In these Deeds, Campbell Estate reserved to itself all subsurface water and water rights with respect to the **Puu Makakilo** Property, including all rights to basal, subterranean and artesian waters. (E-3, P7; E-4, P7; E-5, P3 of 3; E-30; Creps, 9/18/95, P4/L6-13). [PMI FOF41]

434. As a consequence, PMI (nor Chiyoda, its predecessor in interest) was not able to drill a well on the **Puu Makakilo** Property for irrigation purposes and was required to import its irrigation water. (Creps, 9/18/95, P4/L13-15; Dewey, 9/18/95, P6/L1-2). [PMI FOF42]

435. On August 27, 1991, Chiyoda entered into an agreement with Amfac permitting Chiyoda to construct a reservoir on OSCo's Field 101, near the Property (A-2) and to rent the reservoir site on a month-to-month basis. Amfac further agreed to deliver water to the reservoir site for Chiyoda's use. (E-10). [PMI FOF43]

436. The reservoir site was to hold Waiahole Ditch water for transmission to the **Puu Makakilo** Property. (Creps, 9/18/95, P3/L2-3). [PMI FOF44]

437. By Tenancy Agreement dated November 5, 1991, OSCo and Makakilo Golf Corp. (a company affiliated with Chiyoda) reaffirmed the provisions of the August 27, 1991 letter agreement. (E-11). [PMI FOF45]

438. In an agreement dated April 23, 1992, Amfac agreed to use its best efforts to supply approximately 500,000 gallons of Waiahole Ditch water per day to the reservoir constructed in Field 101 for Makakilo Golf Corp.'s use for temporary irrigation relating to the Makakilo Golf Course. (E-12). [PMI FOF46]

439. OSCo charged Chiyoda a fee of \$0.69 per 1,000 gallons for delivery of Waiahole Ditch water as early as October 4, 1991. (E-13; Creps, 9/18/95, P3/L8-9). [PMI FOF47]

440. Later, such delivery fees were increased to \$1.20 per 1,000 gallons, which is the price currently charged PMI. (E-14 to E-23; E-26 to E-28; Creps, 9/18/95, P2/L11-14, P3/L9-11; Dewey, 9/18/95, P3/L20-23). [PMI FOF48]

441. Waiahole Ditch water was used on the **Puu Makakilo** Property for irrigation purposes continuously from October 1991 to the present. (E-13; E-14; E-15; E-16; E-17; E-18; E-19; E-20; E-21; E-22; E-23; E-26(a)-(f); E-27(a)-(i); E-28(a)-(f); E-41). [PMI FOF49]

442. Chiyoda commenced mass grading for construction of the Makakilo Golf Course in late 1990 which continued through 1992 (E-7, E-44, Shiraki Tr. 6/30/95,

P24/L20-25, P25/L1-7). The **Puu Makakilo** Property was being irrigated during these grading operations (Shiraki Tr. 6/30/95, P25/L1-7) with non-potable water from the Waiahole Ditch (E-10, E-11 and E-12). [PMI FOF50]

443. The **Puu Makakilo** Property is approximately 312 acres in size. (E-1; E-24; Creps, 9/18/95, P2/L7-8; Creps Tr. 12/21/95, P49/L2). [PMI FOF51]

444. The **Puu Makakilo** Property is currently improved with the partially-completed Makakilo Golf Course occupying approximately 230 acres of the total land area. (E-44; Creps, 9/18/95, P2/L8-9). [PMI FOF52]

445. PMI purchased the **Puu Makakilo** Property and the partially-completed Makakilo Golf Course improvements for \$12,600,000.00 by Commissioner's Deed dated November 21, 1994, identified as Tax Map Parcel (1) 9-2-3-74 (E-1; E-24; Creps, 9/18/95, P2/L4-6; Creps Tr. 12/12/95, P49/L1-3), and holds Land Court Certificate of Title No. 448,117 for it. (E-29). [PMI FOF53]

446. At the time PMI purchased the **Puu Makakilo** Property, seven of the eighteen holes of the Makakilo Golf Course were completed and landscaped (Creps. 9/18/95, P3/L20-21); and a clubhouse facility had been substantially completed. (Creps Tr. 12/21/95, P49/L5-6). [PMI FOF54]

447. Waiahole Ditch water is currently used to irrigate the Makakilo Golf Course and surrounding areas on the Property, to maintain the landscaping, and for dust control purposes. (Creps, 9/18/95, P3/L11-13, 19-23; Dewey, 9/18/95, P3/L23-26, P4/L1-2). [PMI FOF55]

448. **At the present time,** Waiahole Ditch water is the most economical, non-potable water available for irrigating the **Puu Makakilo** Property. (Creps, 9/18/95, P4/L15-17). [PMI FOF56]

449. Pacific Land assists clients in the development of resort projects, including golf course developments, from the planning stage through construction and start-up of operations. (Dewey, 9/18/95, P1/L28-31, P2/L1-2). [PMI FOF63]

450. Pacific Land was hired by Grace Pacific Corporation, to assist in the final design of the Makakilo Golf Course, to develop cost estimates for completion of the improvements, to serve as project manager during the construction phase, to assist in the negotiation of construction contracts, to develop cost analyses for the operation of the golf course, to prepare pro formas, and to assist in the hiring of employees and other personnel to manage the golf course and clubhouse upon completion of construction. (Dewey, 9/18/95, P3/L4-16). [PMI FOF67]

451. Pacific Land also investigated the potential sources of nonpotable water for irrigation purposes. (Dewey Tr. 12/21/95 at 64, lines 2-4). Pu'u Makakilo is paying OSCO \$1.20 for each thousand gallons of water used to irrigate the seven holes that have been landscaped, as well as for dust control purposes. (Dewey Tr. 12/21/95 at 64, lines 5-8). [KSBE FOF823]

452. Pacific Land estimates that because of the rainfall, wind conditions, runoff and location of the golf course, about a million gallons of water per day for irrigation purposes will be required. (Dewey Tr. 12/21/95 at 64, lines 10-13). The Waiahole Ditch system is the most economically feasible source of nonpotable water. (Dewey Tr. 12/21/95 at 64, lines 13-14).

453. The City and County of Honolulu does not oppose the use of Waiahole Ditch water for golf course irrigation and does not find the use of Waiahole Ditch water for golf course irrigation to be inconsistent with City and County of Honolulu's development plans. (Ukishima Tr. 11/15/95, P37/L6-14). [PMI FOF70]

454. Although R-1 water would be allowed under the Guidelines, there are no treatment plants that are producing R-1 quality water anywhere on Oahu; many restrictions would apply to the use of R-1 water over the Pearl Harbor aquifer and it would be very expensive to treat and pump R-1 water. (Anderson Tr. 2/1/96, P133/L11-14, P188/L15-17). [PMI FOF75]

455. The Conditional Use Permit (E-2) for the **Puu Makakilo** Property requires the use of non-potable water having less than 200 PPM of chlorides. R-2 wastewater effluent **may** contain[s] chloride concentrations higher than that permitted under the Conditional Use Permit. Thus, the Conditional Use Permit **may** prohibit[s] the use of such effluent on the Property for irrigation purposes, even assuming its availability. (Dewey Tr. 12/21/95, P65/L25, P66/L1-8). [PMI FOF76]

456. A fully operational golf course will typically employ between 40 and 60 people at any one time. (Dewey, 9/18/95, P7/L14-17) and will generate annual revenues of approximately \$4,600,000.00. (Dewey, 9/18/95, P7/L20-21). [PMI FOF79]

457. After having studied water usage of other golf courses in the area; taking into account the topography, wind conditions and annual precipitation and other factors at Puu Makakilo, it is estimated that it will take approximately 1,000,000 gallons of water per day at peak usage to adequately irrigate the Makakilo Golf Course once completed. (Dewey, 9/18/95, P7/L22-26, P8/L1-4). [PMI FOF80]

458. PMI has made arrangements to minimize the amount of water for irrigation

purposes for the Makakilo Golf Course by using a computerized, state-of-the-art irrigation system which measures humidity, temperature, precipitation and other factors, resulting in a delivery of only that amount of water necessary in order to maintain healthy turf grass. The proposed irrigation system will be zone-controlled to carefully regulate the use of water of varying irrigation needs. Sprinkler heads will be placed more closely together with shorter "throw" to reduce water loss through evaporation. (Dewey, 9/18/95, P8/L8-19). [PMI FOF81]

459. In addition, lysimeters are required by the State Department of Health to be installed to monitor any effects on groundwater from chemicals applied to the Makakilo Golf Course **[on the Property]**. (Dewey, 10/30/95, P2/¶4). [PMI FOF82]

460. A drainage report for the Makakilo Golf Course concludes that the grading and planned vegetative cover for the golf course will actually reduce on-site water runoff. Much of the **Puu Makakilo** Property's steeply-sloped areas with poor ground cover will be replaced by milder slopes and turf grass. (Dewey, 9/18/95, P9/L18-25, P10/L1-2). [PMI FOF83]

461. The nearest available alternate source of water is several miles away at Barbers Point. Using this water, however, would require construction of a treatment facility to reduce chloride levels to below 200 parts per million. Then the water would have to be pumped three (3) miles uphill over property owned by third parties, including HFDC, to reach the project site. Easements would have to be obtained from the **[effected] affected** landowners and tenants to install a transmission pipeline. (Dewey Tr. 12/21/95 at 64, lines 15-24). The estimated cost for this water would be \$3.50 per thousand gallons. (Dewey Tr. 12/21/95 at 65, lines 1-2). [KSBE FOF826]

462. The previous owners who started this development may have believed that the \$3.50 per thousand gallons cost for water would be offset by their expected return from memberships. However, that was five (5) to seven (7) years ago when golf courses had much "rosier" prospects. (Dewey Tr. 12/21/95 at 71, lines 3-5). The current owners of the Pu'u Makakilo golf course, however, took over in 1994, when the issue over Waiahole water had already arisen. (Dewey Tr. 12/21/95 at 75, lines 7-21). [KSBE FOF828]

463. Major design changes, such as the move from big, wide fairways and irrigated grass areas between the fairways to "target" golf, are part of the plan to save water. (Dewey Tr. 12/21/95 at 76, lines 18-21). [KSBE FOF832]

464. The course may also install a new type of turfgrass developed by Texas A & M University that uses a lot less water. (Dewey Tr. 12/21/95 at 77, line 4-6). The

State recently approved its use in Hawaii. (Dewey Tr. 12/21/95 at 76, lines 24-25). [KSBE FOF833]

465. The property was originally described in the Conditional Use Permit ("CUP") as vacant, dry range land with scrub vegetative cover. It was susceptible to erosion and the creation of high levels of ambient dust. The property has a Land Study Bureau rating of "E" and has steep topography, making it extremely poor land for agricultural use. (Dewey Tr. 12/21/95 at 65, lines 6-11). [KSBE FOF834]

466. Unlike the Pu'u Makakilo course, other courses, such as Ewa Beach International, are not limited by chloride restrictions. Thus, they are free to use water with high salinity from the nearby caprock wells. Thus, water costs for the other courses are significantly less than those for Pu'u Makakilo. (Dewey Tr. 12/21/95 at 72, lines 15-22). [KSBE FOF836]

#### **h. Nihonkai**

467. On July 28, 1987, Nihonkai purchased from the Robinson Estate 203.18 acres of land located in Kunia, identified as TMK 1-9-4-4-9. That land **[is] was** subject to the unrecorded lease dated January 1, 1956, between Oahu Sugar Company, Limited, and the Robinson Estate. Said lease was amended by unrecorded instrument dated May 15, 1967, and December 31, 1973. Ota, WDT, 9/18/95, ¶2. [NIH FOF1]

468. On January 10, 1989, Nihonkai purchased from the Robinson Estate 1.35 acres and 1.43 acres of land located in Kunia, identified as TMK 1-9-2-4-2, and 1-9-2-4-7. Ota, WDT, 9/18/95, ¶6. [NIH FOF2]

469. All of the lands owned by Nihonkai and purchased from the Robinson Estate are commonly known as "Field 280". Field 280 is located along the Waiahole Ditch system. Ota, WDT, 9/18/95, ¶11. [NIH FOF3]

470. The Department of Land Utilization map shows Field 280 as agriculture-1. Ota, WDT, 9/18/95, ¶¶5, 9. [NIH FOF4]

471. The State Land Use Commission map shows Field 280 as agriculture. Ota, WDT, 9/18/95, ¶10. [NIH FOF5]

472. Under the revised Development Plans, Field 280 is designated as a Priority 1 land and is outside of the Urban Growth Boundary. Mossman, WDT, 9/18/95, Exhibit 2.10. [NIH FOF6]

473. Field 280 is located mauka of the "No Pass Zone", above the Pearl Harbor potable aquifer. Lao, WDT, 9/18/96, Figure 8. [NIH FOF7]

474. Field 280 has a (1) U.S. Soil Conservation Service rating of class I, II, and III when irrigated; (2) a Land System Bureau soil rating of class "A" and "B"; and (3) an Agricultural Lands of Importance to the State of Hawaii (Revised) rating of "prime agricultural land." Therefore, Field 280 is considered a "prime of the prime" agricultural land. Schwind, WDT, 9/18/96, P.8/L.13-15, Table B-3, Table B-4, Map B-1. [NIH FOF8]

475. Field 280 has been utilized by Oahu Sugar Company, Limited for sugar cane crops, and has been irrigated by waters from the Waiahole Ditch system. Ota, WDT, 9/18/95, ¶12. [NIH FOF9]

476. On July 15, 1992, Oahu Sugar Company used approximately 1.35 MGD of Waiahole Ditch water on Nihonkai's Field 280 for agriculture. Ota, WDT, 9/18/95, ¶16; Affidavit of Bert L. Hatton, Exhibit A-4, Table 2, filed on June 26, 1995; Order Number 10, October 16, 1995. [NIH FOF10]

477. Since July 15, 1992 to the present, Nihonkai's lands continue to be used for agricultural purposes. Ota, WDT, 9/18/95, ¶17. [NIH FOF11]

478. Nihonkai's agricultural use of Field 280 is an "existing use" allowed to continue under HRS §174C-48(a). Order Number 8 dated August 15, 1995; Order Number 10 dated October 16, 1995. [NIH FOF12]

479. Nihonkai has leased to Alec and Mike Sou all 205 acres of its property located at Kunia, identified as TMK 1-9-4-4-9, TMK 1-9-2-4-2, and 1-9-2-4-7. The lease is for a ten (10) year term, and the use of the property is for diversified agriculture. Sou, WDT, 9/18/95, ¶¶3, 4, 11; Sou, TR, 12/13/95, P.34/L.19-25. [NIH FOF13]

480. The amount of water used will vary depending on the crop, season, weather, how long a field was fallow, and market factors. Sou, WDT, 9/18/95, ¶21. [NIH FOF21]

481. The Sours will be using drip irrigation as well as overhead irrigation, thereby emphasizing conservation and economic efficiency in the use of Waiahole Ditch water to irrigate Field 280. Sou, WDT, 9/18/95, ¶22. [NIH FOF22]

482. The proposed agricultural operation of Nihonkai and its tenant is consistent with the City's land use agricultural designation on the Central Oahu Development

Plan for this land. Soon, Tr., 11/14/95, P.75/L.5-8. [NIH FOF26]

483. Field 280 was included in Waiahole Irrigation Company's ("WIC") June 3, 1993 application which was timely filed. Order Number 8 dated August 15, 1995; Order Number 10 dated October 16, 1995. [NIH FOF30]

484. Nihonkai requested .50 MGD of Waiahole Ditch water for use by its tenants. WIC's June 3, 1993 WUPA; Vierra, Ex. A-201, Table 2.1. [NIH FOF31]

485. Nihonkai paid Robinson \$5.875 million for the land it purchased in Kunia, including the 1.43 acres and the 1.3843 acres it purchased on January 10, 1989. (Ota Tr. 12/13/95 at 55, lines 21-25; Tr. 12/13/95 at 56, line 1; Affidavit rec'd 2/18/95, par. 6). When Nihonkai purchased the Robinson property, it intended to develop a golf course at that time. (Ota Tr. 12/13/95 at 56, lines 8-11). [KSBE FOF606]

**i. DLNR (Waiawa Correctional Facility)**

486. On October 2, 1995, the Joint Applicants submitted a "clarification letter" showing the breakdown of the various existing and proposed uses of Waiahole Ditch water. The Waiawa Correctional Facility is listed for 0.15 mgd for domestic/agriculture uses at TMK 9-6-5:011 & 9-6-5:012. 10/2/95 Clarification Letter. [CWRM FOF12]

**j. KSBE**

487. On September 28, 1994, KSBE filed a water use permit application for 4.2 MGD water from the Waiawa Development Tunnel (Well No. 2657-05), which is situated within the Waipahu-Waiawa Water Management Area for existing irrigation uses at Waiawa nursery and nonpotable irrigation uses at the proposed Waiawa by Gentry Project. (Water Use Permit Application, 9/28/94). [KSBE FOF24]

488. Specifically, Waiawa Nursery entered into a lease with Gentry Development Company ("Gentry") on about January 1, 1992, which entitled Waiawa Nursery to use approximately thirty-six (36) acres of land to cultivate landscape and plant material for future development projects for Gentry Homes. As of July 15, 1992, Waiahole Ditch water was being used to irrigate these Waiawa lands by Waiawa Nursery. (Ouye (Existing Use) Tr. 6/30/95 at 51, lines 2-15). [KSBE FOF907]

489. Hawaii Food Products, Incorporated ("HFP") is a manufacturer and distributor of fresh island pork, as well as byproducts like laulau, kalua pig, char siu, and roast pork. HFP has set a lease with Gentry to farm approximately three (3)



acres of these Waiawa lands. Recently, HFP executed another lease with Gentry for another thirty (30) acres of these Waiawa lands. (Oshiro (Existing Use) Tr. 6/30/95 at 52, lines 14-25; at 53, lines 1-2) [KSBE FOF908]

490. Since 1992, HFP cultivated ti leaves and banana. Currently, HFP has approximately ten (10) acres ready to plant, including two (2) acres for taro and between a half (1/2) to one (1) acre for banana under the new lease. In 1996, HFP plans to cultivate the remaining twenty (20) acres, and may be seeking **[for]** more acreage five (5) years from now. As of 1992, HFP was utilizing the Waiahole Ditch water for its agriculture use. (Oshiro (Existing Use) Tr. 6/30/95 at 53, lines 13-20). [KSBE FOF909]

491. On May 17, 1988, the LUC approved the petition to reclassify approximately 1,395 acres of land, known as "Waiawa by Gentry" project, to the Urban District (LUC Docket No. A87-610). The Waiawa by Gentry project is consistent with the objectives, policies and priorities of the Hawaii State Plan, HRS Chapter 226. (Kobayashi Tr. 11/21/95 at 129, lines 1-18; Ex. J-68). [KSBE FOF65]

492. OSP also recommended for urbanization Gentry's remaining lands in Waiawa comprising of approximately 1,067 acres. Such lands must be urbanized to meet the deficit in urbanized lands needed in 2020. The urbanization of such lands also satisfy the need for affordable housing, preservation of agriculture and open space, and minimizes public infrastructure costs. Moreover, OSP's recommendations are in conformance with and/or consistent with HRS Chapter 205, and the objectives and policies of the Hawaii State Plan, HRS Chapter 226. (Kobayashi Tr. 11/21/95 at 134, lines 12-25; at 135, lines 1-20). [KSBE FOF66]

493. To the extent that certain other portions of KSBE's lands at Waiawa are classified in the Agricultural District, such lands could therefore be used for nursery operations, taro operations and other farming operations. These specific agricultural land uses are consistent with the Agricultural District as defined by the State Land Use Law, HRS Chapter 205. Moreover, the use of nonpotable Waiahole Ditch water for these agricultural uses is consistent with HRS Chapters 205 and 226. (Kobayashi Tr. 11/21/95 at 136, lines 1-25). [KSBE FOF67]

494. Waiawa, where KS/BE proposes to use water from the Waiāhole Ditch, receives 50 to 90 inches of rainfall per year. Tom Nance, December 13, 1995, p. 163, ll. 10-17. [WWCA FOF50]

495. Full build-out of the Waiawa by Gentry project will not occur for 20 to 30 years. Patrice Liu, December 13, 1995, p. 133, ll. 1-4. [WWCA FOF51]

496. Phases beyond Phase I of the Waiawa by Gentry project have not received development plan approval, and none of the project has received zoning approval. Patrice Liu, December 13, 1995, p. 141, ll. 9-11. [WWCA FOF52]

497. The City and County of Honolulu has performed feasibility studies of using treated effluent from Honouliuli over areas in Central Oahu. (Liu Tr. 12/13/95 at 141, lines 2-5). Gentry has not performed any similar feasibility studies for its project, which is located in Central Oahu. (Liu Tr. 12/13/95 at 141, lines 6-8). [CWRM FOF13]

498. The City and County Board of Water Supply has discouraged Gentry from using treated effluent over its project lands because the project is located over a potable water aquifer. (Liu Tr. 12/13/95 at 140, lines 3-12). [CWRM FOF14]

**k. West Beach Estates**

499. In the amended application dated October 24, 1994 ("the Joint WUPA"), West Beach Estates (**WBE**) requested 1.636 mgd of water for landscaping and golf course irrigation at Ko Olina Resort, Phases 1 and 2. [WBE FOF4]

500. In a letter dated January 12, 1995, and filed with the Commission on January 13, 1995, WBE submitted further information to the Commission regarding the property for which the water was being requested, including tax map key nos., net irrigable acreage, average water demand and current zoning. [WBE FOF5]

501. In its January 12, 1995 letter, WBE stated that its proposed use of Waiahole Ditch water was a "new use", not in existence on July 15, 1992. [WBE FOF6]

502. In Order No. 8, Interim Order Identifying "Existing Uses" Allowed to Continue Under HRS §174C-48(a) dated August 15, 1995, the Commission confirmed that WBE seeks a new water use not in existence on July 15, 1992. [WBE FOF7]

503. Phase 1 and Phase 2 of the Ko Olina Resort is being developed as a resort-residential complex, which includes several hotel sites, two golf courses, tennis complex, marina, low and medium density apartments, park and open areas, school and commercial areas. Affidavit of Kenneth M. Williams, Jr., ¶3; Williams, Tr., 12/21/95, P83/L2-6. [WBE FOF8]

504. The water sources currently serving the existing uses at Phase 1 of the Ko Olina Resort do not provide enough water to supply the remainder of landscaping uses within Phase 1, and cannot supply the proposed Phase 2 golf course and other

Phase 2 landscaping uses. Williams Tr., 12/21/95, P83/L10-23. [WBE FOF9]

505. A dual water system as required by the Board of Water Supply of the City and County of Honolulu has been implemented at Ko Olina Resort to supply potable water for human consumptive uses and non-potable water for irrigation. Williams Tr., 12/21/95, P83/L24-25; Kea Tr., 12/21/95, P94/L20. [WBE FOF11, page 3]

506. The Ko Olina Phase 2 Golf Course contains 183 acres which will require an average of 0.70 mgd of irrigation water. Affidavit of Kenneth M. Williams, Jr., ¶7. [WBE FOF11, page 4]

507. Irrigation of Ko Olina Phase 2 Resort, residential, park and commercial landscaping within an area of approximately 190 acres will require an average of 0.385 mgd of irrigation water. Affidavit of Kenneth M. Williams, Jr., ¶7. [WBE FOF12]

508. Irrigation of Ko Olina Phase 1 Resort, residential, park and commercial landscaping within an area of approximately 272 acres will require an average of 0.551 mgd of irrigation water. Affidavit of Kenneth M. Williams, Jr., ¶7. [WBE FOF13]

509. WBE through its consultants has evaluated the use of alternative sources of non-potable water at Ko Olina Resort, but has not been successful in acquiring such use of alternative sources. Williams Tr., 12/21/95, P84/L4 - P85/L13. [WBE FOF14]

510. The Makaiwa Aquifer is not **believed to be** a viable source of non-potable water for the Ko Olina Resort because it contains too little water which is too high in salinity to be used for irrigation. Williams Tr., 12/21/95, P84/L6-11. [WBE FOF15]

511. An on-site caprock aquifer well is not viable to service the needs of Ko Olina Resort because the on-site caprock lacks sufficient permeability to allow successful well development, and the water therein is too high in salinity. Williams Tr., 12/21/95, P84/L12-17. [WBE FOF16, page 4]

512. The water in off-site caprock aquifer wells is very limited in supply, with no excess allocation available to service Ko Olina Resort. Williams Tr., 12/21/95, P84/L18-22. [WBE FOF17]

513. Desalination of seawater for use at Ko Olina Resort is not economically feasible. Williams Tr., 12/21/95, P85/L4-7. [WBE FOF16, page 5]

514. WBE has applied to the Commission for the use of 1.636 mgd of water from the Ewa-Kunia Aquifer through an on-site basalt aquifer well, but has not received approval for such use. Williams Tr., 12/21/95, P84/L8-13. [WBE FOF20]

515. By letter dated July 15, 1996, the Land Use Commission of the State of Hawaii advised the Commission that the location of the proposed water use for WBE **[are] is** within the State Land Use Urban District. [WBE FOF21]

516. HRS 205-2(b) provides that Urban Districts include activities or uses as provided by ordinances or regulations of the county within which the urban district is situated. [WBE FOF22]

517. The Ko Olina Resort Development is consistent with its State Land Use District Urban designation and the Hawaii State Plan. Kobayashi, Tr. 11/21/96; [WBE FOF23]

518. The proposed uses within Ko Olina Resort are consistent with the policies set forth in the City and County of Honolulu's General Plan and Development Plans including the policy to direct population growth to a secondary urban center in the West Beach/Makakilo/Kapolei area. Soon, Tr. 11/14/95, P68/L5-21. [WBE FOF24]

519. WBE's Ko Olina Resort Development and golf courses (shown on the Ewa Development Land Use Map) are consistent with the land use designation in the City's Ewa Development Plan. Soon, Tr. 11/14/95, P73/L9-11. [WBE FOF25]

### **3. Interested Parties**

#### **a. Del Monte**

520. Del Monte is looking to develop export markets for Hawaii grown melons, tomatoes, and onions. It hopes to market these products on the West Coast of the United States, Canada, and the Far East. (Nishida Tr. 12/13/95 at 8, lines 8-21). [KSBE FOF661]

521. It was projected that Del Monte would need 1.5 million gallons of water per day for immediate use. For the next two (2) to three (3) years Del Monte's water needs exceed **[to]** 3 million gallons per day. Del Monte uses between 30 and 35 million gallons of water per month. Sometimes the usage goes as high as 60 million gallons per month. (Nishida Tr. 12/13/95 at 9, lines 14-19; at 10, lines 1-4). [KSBE FOF662]

522. [Pineapple] It is estimated that pineapple crops require approximately 2,000 gallons of water per day per acre. Potato crops need about 5,700 gallons per day per acre. Pumpkin crops generally necessitate between 3,000 and 3,500 gallons per day. Del Monte used these averages to calculate how much water it would need per month. (Nishida Tr. 12/13/95 at 10, lines 7-25). [KSBE FOF663]

**b. Hawaii Farm Bureau**

523. Approximately 2,000 members belong to this non-profit organization that supports the agriculture industry. It represents farmers throughout the State of Hawaii, including those who work the land on the Windward side of Oahu. (Hamachi Tr. 12/21/95 at 99, lines 18-21; at 95, lines 19-25; at 96, lines 9-14; at 99, lines 22-25; at 100, lines 1-2). [KSBE FOF753]

524. Diversified agriculture benefits Hawaii in many ways. First, it broadens the State's economic base. This reduces Hawaii's dependence on imported farm products, thereby increasing Hawaii's self-sufficiency. Second, diversified agriculture creates opportunities for a crop export market from Hawaii. It creates jobs not offered by other industries, and fosters an aesthetically pleasing open space. Third, it gives the people of Hawaii a chance to purchase locally grown, fresh produce. Fourth, it perpetuates an agricultural lifestyle that is quickly disappearing from Hawaii. (Hamachi Tr. 12/21/95 at 97, lines 13-22). [KSBE FOF755]

525. Thousands of acres of land formally cultivated by OSCO have been released. This opens up opportunities for diversified agriculture to be farmed upon extremely fertile land. (Hamachi Tr. 12/21/95 at 97, lines 23-25; at 98, lines 1-4) [KSBE FOF756]

526. Central Oahu also provides the crops with superb climactic conditions and a consistent source of labor from Leeward farmers who want to work. (Hamachi Tr. 12/21/96 at 100, lines 9-11). [KSBE FOF757]

527. Many farmers have expressed an interest in the opportunities that have opened up as a result of OSCO's closing. The Farm Bureau has received inquiries from vegetable farmers, seed corn farmers, taro farmers, and banana farmers. The Farm Bureau provides technical support and information in response to these inquiries. (Hamachi Tr. 4/3/96 at 101, lines 3-18). [KSBE FOF758]

528. Many farmers are taking advantage of this opportunity. Hundreds of acres of Central Oahu land is currently being used for the production of food such as: bell peppers, eggplant, lettuce, spinach, won bok, and many other crops. Central Oahu has never grown these types of crops on such a large scale before. (Hamachi Tr.

12/21/95 at 98, lines 9-14). [KSBE FOF759]

529. Both large and small scale farms are involved in cultivating diversified agriculture crops. However, the production that is currently underway has only touched upon the vast potential for this new industry. Many farmers do plan to expand their present diversified operations to a larger scale. Others plan to begin to grow these products. Farmers are willing to risk their own capital to venture forth in diversified agriculture. (Hamachi Tr. 12/21/95 at 98, lines 15-22; at 100, lines 11-12). [KSBE FOF760]

530. The Farm Bureau encourages active farmers to share their thoughts and ideas in order to work together to form a direction as a statewide organization. This promotes cooperation and coordination among the farmers throughout Hawaii. (Hamachi Tr. 12/21/96 at 16-20). [KSBE FOF763]

531. The Farm Bureau is aware that WIC may raise water prices in the future. However, the Bureau would support maintaining the water prices at as low a rate as possible, to the extent that some controls can be placed on the situation. (Hamachi Tr. 4/3/96 at 120, lines 21-25; at 121, lines 1-5) The Farm Bureau believes that WIC would keep the price of water down at 35 cents per thousand gallons. The Farm Bureau is confident that this price will remain steady for the near future up to five (5) years. Since the landlords in Central Oahu have a stake in keeping their tenants, they will need to assure that water is available to maintain viable crops. Therefore, many people will be advocating for this low price of water to continue. (Hamachi Tr. 4/3/96 at 126, lines 18-24; at 127, lines 3-8; at 128, lines 4-15). [KSBE FOF764]

532. The Farm Bureau is unaware of any initiatives that are geared towards gaining federal funding for the structuring of irrigation systems or **[the]** for subsidizing agricultural water. (Hamachi Tr. 12/21/95 at 131, lines 16-21). [KSBE FOF768]

533. Small farms that use Board of Water Supply water on Oahu pay 69 cents per thousand after 11,000 gallons. The high cost of water and the \$30,000 it takes to install a meter is extremely prohibitive. Also, in some areas you cannot even obtain a meter. Those farmers that do acquire both water and a meter make it because their farms are highly intensified. Therefore, they manage all of the labor themselves. However, disease and other problems that affect agriculture become intensified as well. Consequently, a high price of water causes many difficulties in the future. (Hamachi Tr. 4/3/96 at 136, lines 10-25; at 138, lines 8-22; at 137, lines 1, 6-21). [KSBE FOF769]

**c. Navy**

534. The total Joint Water Use Permit Application (the "WUPA") request for Waiahole Ditch water is 22.49 mgd at the North Portal. Lands included in the WUPA which would not be irrigated by Waiahole Ditch water are the lands owned by the Navy and the lands below the H-1 freeway owned by the State of Hawaii. (Joint WUPA; 10/2/95 clarification letter to the Commission from Joint Applicants) [NAVY FOF1]

535. The Navy is a riparian owner of approximately 187 acres of land along Waikane Stream. This land is within the hydrologic unit from which the water sought by the applicants in this proceeding is to be drawn. (Motion by the Department of the Navy for Reconsideration of the Order of May 30, 1996 Granting and Denying Applications to Participate in the Combined Contested Case Hearing, 6/6/95) [NAVY FOF2]

536. The Navy supplies water to over 40,000 Navy, Air Force, and Army residents and the industrial work force of over 6,000 personnel. (DiLullo Tr. 12/21/95 at 141, lines 15-17). [KSBE FOF868, NAVY FOF3]

537. The Navy operates four (4) "Maui"-type wells which draw large quantities of water at sea level from horizontal developed infiltration tunnels. These wells are also called skimming tunnels, unlike other types of wells that draw water from deep into the underground lens. (DiLullo Tr. 12/21/95 at 141, lines 18-22). [KSBE FOF869]

538. The Pearl Harbor part of the system consists of the Waiawa, Red Hill, and Halawa shafts. The Barbers Point shaft is from the Waianae aquifer. (DiLullo Tr. 12/21/95 at 141, lines 23-25). [KSBE FOF870]

539. The Waiawa shaft provides 16 MGD, or seventy-five percent (75%) of Pearl Harbor's water requirements. Red Hill provides 4 MGD. Halawa provides 0.5 MGD and is used primarily as a backup because of its low yield and high chlorides. (DiLullo Tr. 12/21/95 at 142, lines 1-6). [KSBE FOF871, NAVY FOF4]

540. The average daily pumpage from the Pearl Harbor system is roughly 22 MGD, with a summer peak season of 34 MGD. (DiLullo Tr. 12/21/95 at 142, lines 7-8). The Barbers Point system provides about 2.5 MGD with peaks of 3.5 MGD. (DiLullo Tr. 12/21/95 at 142, lines 9-10). [KSBE FOF872, NAVY FOF4]

541. The general quality of the water currently drawn from the Waiawa shaft is very good, with chlorides down to the 40 parts-per-million ("ppm") range. Water from Red Hill is 70-80 ppm. The Barbers Point shaft has chlorides of 230 ppm. However, that amount appears to be decreasing since the change in irrigation and pumping by OSCO. (DiLullo Tr. 12/21/95 at 142, lines 13-18). [KSBE FOF873, NAVY FOF5]

542. The Waiawa shaft is a major source of potable water to the Navy and other services. Degradation or contamination of this source could have a major impact on military residents and industrial work force. (DiLullo Tr. 12/21/95 at 144, lines 19-22). [KSBE FOF875]

543. When the Waiawa shaft was constructed, the water had chlorides in the 40-50 ppm range. Over time, the chloride concentration increased to over 300 ppm. (DiLullo Tr. 12/21/95 at 142, lines 21-24). The cause of this increase is believed to be either return irrigation or from overpumpage. (DiLullo Tr. 12/21/95 at 143, line 1). Irrigation water from Oahu Pump no. 6 used on fields at the Waiawa shaft exceeded 1300 ppm. (DiLullo Tr. 12/21/95 at 143, lines 2-4). The Navy and the USGS did a study on the impact of irrigation to the Waiawa shaft and found that the cause of the Waiawa shaft's high chloride concentration was due to the return of irrigation to the shaft. (DiLullo Tr. 12/21/95 at 143, lines 5-9). [KSBE FOF876, NAVY FOF6]

544. Furthermore, the University of Hawaii conducted carbon dating of the Waiawa shaft water and found that the water was less than two (2) years old. This indicated that the contamination was coming from above, i.e., from return irrigation. (DiLullo Tr. 12/21/95 at 143, lines 10-15). Had the water been over 2000 years old, the cause of chlorides would have been upconing. (DiLullo Tr. 12/21/95 at 143, lines 15-17). [KSBE FOF877]

545. The conclusion of the study was confirmed when OSCO discontinued pumping and irrigation at Waiawa and the chloride levels dropped from 200 ppm to the current 40 ppm level. (DiLullo Tr. 12/21/95 at 143, lines 21-24). Irrigation in the recharge zone at the Barber's Point shaft also had an immediate impact over its water quality. (DiLullo Tr. 12/21/95 at 144, lines 1-2). [KSBE FOF878]

546. The Navy has an interest in how the land above its wells are used. Since the land above Waiawa and Barbers Point are designated for diversified agriculture, **the Navy believes** irrigation water chlorides should not exceed over 80 ppm. (DiLullo Tr. 12/21/95 at 144, lines 6-10). The Navy feels that any water with chlorides above 80 ppm, applied in any area for a long period of time, would have an impact on the water quality of the shaft below. (DiLullo Tr. 12/21/95 at 153, lines 17-20). [KSBE FOF879]

547. The Navy also feels that water from the Honouliuli sewage treatment plant should not be used because of other possible contaminants and the nature of its immediate impact on the water below. (DiLullo Tr. 12/21/95 at 144, lines 10-12). The possibility of operator error and failure, and the shortcomings of present technology, leads the Navy to conclude that putting effluent over primary water sources will have an impact on water quality. (DiLullo Tr. 12/21/95 at 155, lines



8-12). [KSBE FOF880]

548. Herbicides and pesticides associated with agricultural use are another source of contaminants in the Pearl Harbor aquifer. (DiLullo Tr. 12/21/95 at 5-9). However, those levels were below the technical levels and have diminished in the past six (6) years. (DiLullo Tr. 12/21/95 at 160, lines 20-22; at 161, line 2). [KSBE FOF882]

549. Some of the land above the Waiawa shaft is to be used for the Gentry by Waiawa development. (DiLullo Tr. 12/21/95 at 148, lines 24-25). Residential development of the land should not have any impact on the Waiawa shaft's water quality. (DiLullo Tr. 12/21/95 at 149, lines 3-7). [KSBE FOF883]

550. The Department of Health would be very concerned that water quality would be compromised if reclaimed water were used in areas where the Pearl Harbor aquifer has been shown to be vulnerable to contamination. (Tr. Anderson, 2/1/96, p. 133, lines 3-6) [NAVY FOF7]

551. A study conducted by the U.S. Geological ~~[Service] Survey~~ concluded that the chloride concentrations of about 200 milligrams per liter in the area of the Barbers Point shaft was probably the result of irrigation practices consisting of the application of high chloride pumped water over a large part of the land area. This caused the development of a top layer within the freshwater lens that had a chloride concentration of about 200 milligrams per liter. (Tr. Meyer, 2/15/96, p. 73, lines 5-25; p. 74, lines 1-3, Ex. F-3) [NAVY FOF9]

552. If fresh water were applied to the fields directly mauka of the Barbers Point shaft, the shaft would clean up. (Tr. Meyer, 2/15/96, p. 71, lines 15-25; p. 72, lines 1-3) [NAVY FOF11]

553. Waiahole Ditch water is a low mineral content source of water which has chlorides ranging from 12 to 14 ppm and total dissolved solids ranging from 95 to 105 ppm. (WDT Kawata, 9/15/95, p. 8, para 23; Ex. T-20; Ex. T-21) [NAVY FOF12]

554. The Waiawa shaft is a major source of potable water to the Navy and other services. Degradation or contamination of this source could have a major impact on military residents and the military's industrial work force. (Tr. DiLullo, 12/21/96 p. 145, lines 19-22) [NAVY FOF14]

555. It is the position of the Department of Health['s] that Waiahole Ditch water should be put to higher and better uses, including use for irrigation in areas where

it would have concerns about wastewater reuse, than irrigation over nonpotable water sources such as the Ewa caprock aquifer. (Tr. Anderson, 2/1/96, p. 140, lines 4-19) [NAVY FOF17]

556. The Kamehameha Schools/Bishop Estate lands in the zone of influence of the Waiawa shaft are outside the urban boundary and may be used for agriculture. (Ex. S-51/Ex. WC-1; Tr. Ukishima, 3/5/96, p. 64, lines 2-12) The Campbell Estate has no plans to urbanize its agricultural lands mauka of H-1. (Tr. Goth, 11/30/95, p. 35, lines 2-3; p. 55, lines 25-26) [NAVY FOF18]

557. The Waiahole Ditch and the Pearl Harbor aquifer are interconnected in that the quantity of water flowing through the ditch directly affects the recharge to, and sustainable yield of, the Pearl Harbor aquifer. (Mink, Tr. 1/10/96, p. 75, lines 10-25; p. 76, lines 20-21; Exhibit F-2, p. 17) [NAVY FOF19]

558. Sustainable yield depends on the equilibrium head selected to prevent diminution of the quantity and quality of the water pumped. Sustainable yield **[is equal to] can be estimated by multiplying** recharge times a constant, which in turn is a function of equilibrium head and initial head in the groundwater system. Sustainable yield is therefore never equivalent to recharge, but is always a fraction of it, thus an increase in recharge is not matched by an equivalent increase in sustainable yield. (Tr. Mink, 4/17/96, p. 113, lines 5-10) [NAVY FOF21]

559. The Waipahu-Waiawa and Ewa Kunia aquifer systems are affected by Waiahole ditch water. A change in the distribution of Waiahole Ditch water will affect the sustainable yields of these systems (Tr. Lao, 1/09/96 pp. 61-62) [NAVY FOF22]

560. Waiahole Ditch water was not used east of Waiawa valley and therefore the 45 MGD sustainable yield for the Waimalu area is not affected by Waiahole ditch water. (Tr. Lao, 1/09/96, p. 61, line 20; p. 62, line 2) [NAVY FOF23]

561. The use of Waiahole Ditch water for irrigation increases the sustainable yield because its source is external to the Pearl Harbor system. In contrast, use of pumped well water decreases the available sustainable yield because it comes from within the same system. (Tr. Mink, 1/10/96, p. 153, lines 13-23) [NAVY FOF24]

562. The current permitted uses for the Koolau Aquifer exceed the natural **(without return irrigation)** sustainable yield for that aquifer. The current permitted uses for the Waianae aquifer (Ewa-Kunia aquifer) total 18.39 mgd, well in excess of the natural sustainable yield of 11 mgd for that aquifer. (WST Mink, 10/30/95, pp. 1-2) [NAVY FOF27]

563. Increasing the sustainable yield by reducing the equilibrium head would come at a cost of resiting wells to maintain adequate water quality and reduction in the Pearl Harbor Spring flows which are a critical part of the Pearl Harbor environment. (Tr. Mink, 1/10/96, p. 105, line 20; p. 108 at line 3). [NAVY FOF28]

564. Most of the water from the Campbell Estate's makai wells has chlorides in excess of potable water standards, with the highest being in excess of 400 ppm chloride. (Tr. Russell, 11/30/95, p. 27, lines 1-3) [NAVY FOF31]

565. Only the water from the Ewa shaft has chlorides within the 160 ppm limitation established by the Board of Water Supply for irrigation use above H-1. **[The Donna Goth testified that the** water from the Ewa shaft is needed for projected urban demands of the Ewa area. (WST Goth, 10/30/95, p. 3; Tr. Goth 11/30/95, p. 63, lines 9-15; WST Goth, 10/30/95, p. 4) [NAVY FOF32]

566. Total municipal water demand on Oahu is anticipated to increase 55 mgd from the current 154.88 mgd to 208.74 mgd by the year 2020 to meet projected growth. (Tr. Usagawa, 1/23/96, p. 85, lines 16-18; Ex T-120-A) [NAVY FOF33]

567. The areas of the City's Development Plan requiring the greatest amounts of water by the year 2020 based on population projections are Ewa and Central Oahu, requiring 37 of the projected increased needs of 55 mgd. (Tr. Usagawa, 1/23/96, p. 85, lines 19-21; Ex. T-120-A) [NAVY FOF34]

#### **D. Petitions for Reservations of Water**

The Commission is authorized to reserve water, by rule, in water management areas. Section D presents the findings of fact concerning the petitions to reserve water filed by the DOA, OHA, WWCA, KSBE, and DHHL. The Commission does not necessarily agree with the reservation numbers and related findings of fact proposed by the petitioners, but they are included for future consideration. Because reservations of water are conducted as rule making procedures, formal action on the reservations will take place in later, separate, and publically noticed meetings after the contested case proceedings.

##### **1. Department of Agriculture**

568. On November 4, 1993, the DOA filed a petition to reserve 47.60 mgd of Waiahole Ditch water and water from OSCO wells WP-1, WP-2, WP-4 and WP-7 for agriculture, golf courses and groundwater recharge. DOA Petition for Reservation of Water. This amount was amended in January 11, 1996 to request only the entire waters flowing in the Waiahole Ditch as measured at north portal, and

not the wells. Letter to Michael D. Wilson from Rick J. Eichor, dated January 11, 1996. [WIC FOF75]

569. The DOA reservation request included the WUPA request of the Joint Applicants; i.e., it is not in addition to that water use permit request. However, it does not include water applied for by KSBE. DOA Petition for Reservation of Water; Letter to Michael D. Wilson from Rick J. Eichor, dated January 11, 1996. [WIC FOF76]

570. In addition, DOA proposes to use its water reservation to service the prime agriculture lands in Central Oahu, the Waiahole Agricultural Park, and the Kahana Valley area. DOA is excluding golf courses and non-agricultural uses, because those uses have already made their request for water. (Nakatani Tr. 02/06/96 at 103, lines 6-14). [KSBE FOF738]

571. DOA's legal responsibilities **[is] are** to assure that there is an ample supply of water for agricultural use, that there **[is] are** viable lands available for farming, and to provide a necessary infrastructure to maintain viability of the industry. (Nakatani Tr. 02/06/96 at 107, lines 3-7). [KSBE FOF739]

572. DOA has a statutory responsibility to assure there is adequate supply of water for agriculture needs. Retaining the Waiahole Ditch system water in agriculture is important because it is strategically located in an area that can economically service prime A and B lands. (Matsuo Tr. 02/08/96 at 111, lines 5-15). [KSBE FOF747]

## **2. Office of Hawaiian Affairs**

573. On August 31, 1994, OHA petitioned for a reservation of 24 mgd for Native Hawaiian uses in the Waiahole area. OHA's Request for Reservation, dated August 31, 1994. [CWRM FOF15]

574. On February 28, 1995, OHA modified its reservation request to 11.1 mgd. OHA Letter to Michael Wilson, dated February 28, 1995. [CWRM FOF16]

575. OHA does not have a record of the number of native Hawaiians who are of fifty percent (50%) blood living in the Waiahole-Waikane watershed area. (Colburn Tr. 5/01/96 at 24, lines 8-16). [KSBE FOF506]

576. In 1989, OHA formulated a blueprint for native Hawaiian entitlements. From that blueprint, OHA established its goals and objectives among which it is to reestablish native Hawaiian water rights. (Kamalii Tr. 5/7/96 at 46, line 25, at 47,

lines 1-5). [KSBE FOF507]

577. OHA's water reservation is based upon information provided by OSP Geographical Information System ("GIS") baseline information. Based on the water demand for low-land taro [of] **claimed to be** about 50,000 gallons of water per acre per day, **it is** estimated that the total reservation is about 11.1 million gallons of water per day. (Manrique Tr. 5/01/96 at 67, lines 6-19). [KSBE FOF510]

578. However, the OSP's GIS has limitations because of its limited sources of information and locational accuracy. As such, the GIS should not be used as a basis to formulate conclusions as to the number of acres of lands suitable for agricultural uses such as taro. (Hirota WRT 10/16/95 at 7, lines 12-17). [KSBE FOF512]

579. The OSP report is for illustrative purposes only and the information should not be used to make decisions requiring more precise and accurate information on irrigation water requirements and crops suitability and agricultural land use projections. (Hirota WRT 10/16/95 at 8, lines 11-15, citing Exhibit No. L-200, page 10). [KSBE FOF513]

580. A claim for water allotment should be based on the number of acres of land planted in taro at the time of the *Mahele* and not on whether an area is deemed suitable for taro growing based on OSP's GIS baseline information. (Saiki WRT to Manrique dated 10/16/95 at 6, lines 2-6). Also, *kula* lands (which included pasture lands) or lands for other agricultural crops were not given consideration for water allotment based on a given quantity of gallonage per acre per day. (Saiki WRT to Manrique dated 10/16/95 at 6, lines 6-9). [KSBE FOF514]

581. Furthermore, OHA does not have any lands in the Waiahole Valley nor are there any plans for the transfer of any lands in Waiahole Valley to OHA. (Colburn Tr. 5/01/96 at 26, lines 1-11). [KSBE FOF515]

### **3. Waiahole-Waikane Community Association**

582. On September 26, 1994 WWCA, the Ohana and KNB requested that the Commission reserve all the water flowing in the Waiahole Ditch, up to the North Portal, for both restoration of streamflows and for present and future agriculture and aquaculture needs in windward Oahu. Order Number 10, Item 3, dated October 16, 1995. [CWRM FOF17]

### **4. Kamehameha Schools/Bishop Estate**

583. On December 15, 1994, KSBE filed a petition to reserve all of the water,

originating from the Ahupua'a of Waiawa and flowing or percolating into the Waiahole Ditch System from Ahupua'a Waiawa to serve the future development of KSBE lands in Waiawa which includes approximately 1,789 acres of land and amounts to water use ranging from 1,200 to 50,000 gallons per day per acre. As previously mentioned, KSBE also filed an application for a water use permit for the same lands and uses. (Petition for Reservation of Water, 12/15/94) [KSBE FOF32, WIC FOF79]

**a. Brief History of KSBE's Lands in Waiawa**

584. KSBE is the fee simple owner of the lands of Waiawa, which is approximately 4,400 acres. Approximately 3,600 acres of these lands are dedicated to the development by Gentry Homes and approximately 800 acres of these lands will remain in forest reserve and other agricultural cultivation. (Tr. 11/09/95 at 79, lines 5-13) [KSBE FOF885]

**b. KSBE's Water Agreements**

585. Although Lease No. 14,965 expired on December 31, 1979, Waiahole Water Company, prior to the expiration date, assigned its rights in the lease to OSCO. Further KSBE agreed to keep Waiahole Water Company as a holdover tenant. A first amendment made an extension of Lease No. 14,965 was entered into between KSBE and OSCO on November 5, 1992 which extended the terms of the Lease to December 31, 1996. (Gilliland Tr. 12/13/95 at 124, lines 7-13 at 126, lines 1-2). [KSBE FOF892]

**c. Waiawa by Gentry Project**

586. On October 22, 1987, an Agreement of Sale Master Lease and Development Agreement was executed by and between KSBE and Gentry. KSBE retained all water rights in the Waiawa Ridge area, which is to be developed as a master planned community called "Waiawa by Gentry." Specifically, KSBE retained the water rights to all tunnel water being used by OSCO, as well as all water rights it may have to the water emanating on the Waiawa land including also any and all easements for access rights to transport and maintain the Waiawa section of the tunnel water system. (Gilliland Tr. 12/13/95 at 124, lines 14-22). [KSBE FOF893]

587. **The proposed** Waiawa by Gentry **project** is a 3,600 acre master planned community situated on KSBE's lands in Waiawa, Central Oahu, Hawaii. The southern boundary of the project is the H-2 Freeway. The project extends up to the lower crest of the Koolau Mountain Range and the Waiahole Ditch traverses a part of the project area from the Adit 8 location. (Liu Tr. 12/13/95 at 128, lines 1-13).

[KSBE FOF894]

**d. Present and Potential KSBE Non-instream Uses**

588. The proposed project plans to include a variety of residential developments, extensive recreational amenities, retail and employment facilities and public facilities such as schools and parks. (Liu Tr. 12/13/95 at 128, lines 19-22). The current plan of the project envisions the development of over 15,000 housing units, two (2) eighteen hole golf courses, and 300 acres of commercial/industrial uses. (Liu Tr. 12/13/95 at 128, lines 23-25; at 129, lines 1-2: Ex. J-55). [KSBE FOF895]

589. Currently, Waiawa by Gentry has State Land Use Commission approval to develop approximately 1,395 acres of the project area and County Development Plan approval to develop approximately 900 acres of the project area. A zoning amendment application for the first increment of the project comprising of approximately 900 acres has been submitted to the County, which includes the two (2) golf courses, commercial and industrial uses, school and park sites, and residential and apartment areas (Liu WDT 9/18/95 at 5, lines 4-14). [KSBE FOF896]

**e. Golf Courses**

590. KSBE's Waiawa by Gentry Project ("Project"), which **[comprises] is comprised** of approximately 3,600 acres, includes two (2) eighteen hole golf courses. (Liu WDT 9/18/95, at 3 lines 1-3) One of the golf courses will be located in the planned retirement community of the Project. (Liu Exhibit J-68, at 12) [KSBE FOF897]

591. The two (2) eighteen hole golf courses are an essential component of the Project's drainage system. On-site reservoirs will be constructed within the golf courses to detain storm water during periods of heavy rainfall in order to maintain present run-off patterns and flows in accordance with City and County of Honolulu drainage standards. (Liu WDT 9/18/95, at 3, lines 18-23) [KSBE FOF898]

592. These golf courses are being designed as 18-hole daily fee courses and are projected to require approximately 1.3 MGD based on estimates provided by the irrigation consultant. These golf courses will be constructed as part of the initial infrastructure necessary to serve the Project, and construction is anticipated to initiate within the next four (4) years. (Liu WDT 9/18/95, at 4, lines 1-8, at 5, lines 15-24) [KSBE FOF899]

**f. Landscaping**

593. Landscaping is also an essential component of this proposed project. The landscape master plan for Waiawa envisions extensive landscaping of major roadways, apartment and commercial areas, common areas, as well as schools and parks. The intent of this plan is to retain a "country" feeling through the use of large canopy trees and ground coverage shrubs. Based on estimates provided by Gentry's irrigation consultant, landscaping of the aforementioned areas will require approximately 1.6 MGD at full buildout of the proposed project. (Liu, Tr. 12/13/95 at 129, lines 15-25; at 130, lines 1-8: Exhibits J-56 and J-57). [KSBE FOF901]

594. Gentry will be utilizing plants that will do well in the Waiawa region to landscape their project, and to the extent possible, Gentry is also promoting xeriscape landscaping. (Liu, Tr. 12/13/95 at 136, lines 1-5). [KSBE FOF902]

595. The total irrigation requirements for the golf courses and the landscaping of the proposed project are projected to be approximately 2.9 MGD. (Nance, 12/13/95, at 151; lines 1-17) (Liu, Tr. 12/13/95 at 130, lines 9-11). [KSBE FOF903]

596. Nonpotable water will also be required for other project related uses on the property. During construction of the proposed project, which is expected to occur over a twenty (20) to thirty (30) year time frame, approximately 500,000 to 750,000 gallons per day will be needed for dust control and other construction related activities. (Liu, Tr. 12/13/95 at 130, lines 12-17). [KSBE FOF904]

597. Construction of both the landscaping and golf courses projects are anticipated to commence within the next four (4) years. The golf courses will be constructed as part of the initial infrastructure necessary to serve the project, and the landscaping will be phased according to the construction of major roadways and commercial and apartment areas. (Liu WDT 9/18/95 at 5, lines 15-25). [KSBE FOF905]

**g. Effluent and Water Quality Concerns**

598. The Waiawa by Gentry project is located above the Underground Injection Control ("UIC") line and the Board of Water Supply has discouraged Gentry from using treated effluent over their project because it may impact the aquifer beneath the project. (Liu, Tr. 12/13/95 at 140, lines 6-25). [KSBE FOF910]

599. Underlying the entire Gentry by Waiawa project site is a very thick water basal lens. At least for the first 150 feet into the aquifer system, the water is very low in chloride, and, therefore, is a very valuable resource for drinking water supply. (Nance, Tr. 12/13/95 at 160, lines 15-21). [KSBE FOF911]

600. Also, the Waiawa by Gentry project is adjacent to the Navy's Waiawa shaft.



The shaft pumps approximately 14 MGD [a day] of potable drinking water. A zone of contribution was delineated by the U.S.G.S. working with DOH as the area of the mauka water shed which contributes water to the Navy's Waiawa shaft. (Nance, Tr. 12/13/95 at 161, lines 1-8). [KSBE FOF912]

#### **h. Water Supply and Distribution**

601. From a water supply and distribution standpoint, all of KSBE's proposed use of water on its Waiawa lands can be accommodated with the available water source, which is the Waiahole Main Bore. (Chuck Tr. 12/14/95 at 73, lines 1-6; at 74, lines 11-25) (Nance Tr. 12/13/95, at 151, lines 18-22). [KSBE FOF914]

#### **5. Department of Hawaiian Home Lands**

602. On January 25, 1995, the Department of Hawaiian Home Lands ("DHHL") [requests] **requested** a water reservation of .410 MGD to serve its beneficiaries on its homestead lands in the foreseeable future, including eighty-two (82) acres in Waiahole, Oahu. [KSBE FOF33, WIC FOF80]

603. DHHL's request for 410,000 gpd is based on 82 acres of land in Waiahole Ag Park times 5,000 gallons per day. Agard, Tr., 5/7/96, P8/L15-22. [WIC FOF341]

604. The State of Hawaii and the Department of Hawaiian Home Lands ("DHHL") entered into a land settlement agreement in 1994 in which eighty-two (82) acres were designated for transfer to Hawaiian home lands. While the transfer of the eighty-two (82) acres at Waiahole has not been consummated, the transfer is expected to take effect in late 1996. (Agard Tr. 5/7/96 at 7, lines 24-25, at 8, lines 1-12). [KSBE FOF516]

605. DHHL is a separate department apart from OHA. Thus, DHHL **owns** and **manages** its own land without OHA having any input. (Colburn Tr. 5/01/96 at 25, lines 5-11). [**Presently,**] **Linda Colburn testified that presently,** there are no plans to transfer lands within Waiahole Valley to DHHL. (Colburn Tr. 5/01/96 at 25, lines 22-25). [KSBE FOF517]

606. [**Furthermore,**] DHHL's request of 410,000 gallons per day does not account for the actual amount of water being supplied by the Waiahole Stream. (Agard Tr. 5/7/96 at 10, lines 8-25). [KSBE FOF519]

607. DHHL was unable to estimate what crops would be grown and whether such crops would include wetland taro. (Agard Tr. 5/7/96 at 17, lines 3-6, lines 17-22). [KSBE FOF520]

608. If the HFDC water system in Waiahole Agricultural Park is available, then DHHL's request for reservation may be moot or may need to be adjusted. Agard, Tr., 5/7/96, P9/L18-P10/L13. [WIC FOF342]

609. DHHL's preference is to use water from the stream, although the HFDC water system has more than sufficient amount of water available. Agard, Tr., 5/7/96, P10/L17-P12/L11. [WIC FOF343]

## **E. Public Trust Doctrine**

A more comprehensive discussion of the public trust doctrine and its applicability to the Water Code and these proceedings is presented in the Commission's Conclusions of Law (Section C, pages 6 to 12).

## **F. Water Resources and Geology**

Section F briefly discusses the geology and hydrology of Oahu, including sections on sustainable yield, recharge, windward area stream flow, and the estimated quantity of water for windward uses.

### **1. Geology**

610. All of the major islands in the Hawaiian chain consist of one (1) or more shield volcanoes primarily composed of very permeable thin basaltic lava flows. Oahu rose as the Waianae and Koolau volcanic shields. (Lao Tr. 1/09/96 at 54, lines 9-18). [KSBE FOF223, WIC FOF370]

611. A broad coastal plain of sediments known as caprock extends from Koko Head to Barbers Point. These sediments cap the basal aquifer and create thick basal lenses by retarding groundwater flow to the sea. (Lao Tr. 1/9/96 at 54, lines 19-23). [KSBE FOF225, WIC FOF372]

612. Oahu depends primarily on three types of groundwater bodies for its water supply: basal lens, dikes and perched water. The most extensive resource is the basal lens of infiltrated rainfall floating upon sea water. (Lao WDT 9/18/95 at 5-6, paragraph 20 and 21; at 8-9). [KSBE FOF226, WIC FOF373]

613. The freshwater floats as a double convex lens upon underlying sea water and its presence displaces the sea water. (Lao Tr. 1/09/96 at 55, lines 13-16). [KSBE FOF227, WIC FOF374]

614. The mixed zone or transition zone is an important element of the freshwater lens because the mixture is created from sea water and fresh water and is not developable for drinking water. The mixed zone is a buffer between fresh water and sea water and grades upward into fresh water and downward into sea water. The midpoint represents 50% sea water and 50% fresh water. (Lao WDT 9/18/95 at 6, paragraph 22; Lao Tr. 1/9/96 at 56). [KSBE FOF228, WIC FOF375]

615. **[For] The Ghyben-Herzberg principle estimates that for** every foot of elevation of the water table above sea level, also known as "head", there are 40 feet of freshwater below sea level until the midpoint of the basal lens is reached. (Lao Tr. 1/9/96 at 55, line 17; at 56, line 13). [KSBE FOF229, WIC FOF376]

616. For optimal development of basal lenses, wells must be properly located, designed and operated to minimize the threat of salt water intrusion. (Lao WDT 9/18/95 at 10, paragraph 34). [KSBE FOF230, WIC FOF377]

## **2. Hydrology**

617. The island of Oahu is comprised of six hydrologic sectors: North, Windward, Central, Waianae, Honolulu and Pearl Harbor. Usagawa Tr. 1/23/96 at 91, lines 16-19; Exhibit T-115). [KSBE FOF231, WIC FOF392]

618. The caprock is not significant to Waiahole water or the sustainable yield of basal aquifers. Its value lies in the potential role to supply brackish water for nonpotable uses, leaving potable water for higher uses. (Lao Tr. 1/09/96 at 58, lines 21-25). [KSBE FOF233, WIC FOF394]

619. At the junction of the Koolau **(now called Waipahu-Waiawa and Waimalu aquifer systems)** and Waianae **(now called Ewa-Kunia aquifer system)** aquifers, there is an alluvial capping over the Waianae aquifer that is covered by the Koolau basalt flows such that most recharge water is directed to the Koolau aquifer. (Lao Tr. 1/09/96 at 59, lines 1-60:10; Meyer Tr. 2/15/96 at 154-55; Exhibit T-91). [KSBE FOF234, WIC FOF395]

620. The historical difference in basal water levels between the Koolau and the Waianae aquifers and the presence of pesticides only in the Koolau aquifer further support[s] that there is minimal exchange between the aquifers. (Lao Tr. 1/09/96 at 60, lines 18-25; at 61, line 1). [KSBE FOF235, WIC FOF396]

621. Application of high quality, low chloride, Waiahole Ditch water preserves the quality of the aquifer. Use of lower quality water would degrade the aquifer. Sato, Tr., 1/9/96, P21/L1-14; DiLullo, Tr., 12/21/95, P144/L13-18. [WIC FOF381]

622. The Pearl Harbor aquifer **sector** supplies water from Waianae to Hawaii Kai. Pearl Harbor provides approximately 43 mgd to Honolulu, and about 4 mgd to the Waianae area. Koolauloa provides 6 mgd to Koolaupoko. Usagawa, Tr., 1/23/96, P90/L11-15. [WIC FOF383]

623. The Pearl Harbor aquifer **sector** is very vulnerable to contamination and the Department of Health will not allow effluent reuse over it without compelling evidence that the wastewater will not contaminate the aquifer. Anderson, Tr., 2/1/96, P132/L16-P133/L6. [WIC FOF385]

624. The primary source of **[groundwater resources] recharge** in the area adjoining and underlying the Waiahole Ditch system is rainfall on the Koolau Mountains leeward of the Koolau crest. Lum, Tr., 12/13/95, P168. [WIC FOF387, **KSBE FOF260**]

625. The ditch system has affected the Waianae basal aquifer (now called the Ewa-Kunia aquifer). This aquifer has been recharged in the past by irrigation return**[ed]** water **[and] on** sugar cane lands by Oahu Sugar Company roughly west of Kunia Road. Lum, Tr., 12/13/95, P168-69. [WIC FOF389]

626. The Pearl Harbor caprock aquifer has been recharged in the past by irrigation return**[ed]** water from sugar cane lands cultivated by Oahu Sugar Company. Lum, Tr., 12/13/95, P169. [WIC FOF390]

627. **[Average flow] Flow** of water from the Waiawa Dike compartments average approximately 4.2 mgd for the period of record from 1970 to 1993. Chuck, Tr., 12/14/95, P72/L8-11. [WIC FOF391]

628. Use of high chloride pumped groundwater or reclaimed wastewater instead of Waiahole water **[would] may** increase the salinity levels of the BWS' wells. Kawata, Tr., 1/23/96, P9/L22-25, P10/L1-3. [WIC FOF409]

### **3. Sustainable Yield**

629. Sustainable yield is the estimated maximum rate of withdrawal from the aquifer without impairing the water quantity or quality. (Lao WDT 9/18/95 at 21, paragraph 72; Mink Tr. 1/10/96 at 79, lines 18-20). [KSBE FOF236, WIC FOF410]

630. [The] **Barry Usagawa, BWS, testified that the** sustainable yield is estimated to be 465 MGD for the island of Oahu with approximately 350 MGD of existing allocation. (Usagawa Tr. [1/09/96] **1/23/96** at 92, lines 5-6). [KSBE FOF237, WIC FOF411]

631. The aquifers with remaining available sustainable yield are in the North and Windward sectors, where the development and transmission of water to areas of demand will be more costly. (Usagawa WDT 9/18/95 at 22, paragraph 63; Usagawa Tr. 1/23/96 at 92, lines 12-14). [KSBE FOF238, WIC FOF412]

632. The current sustainable yield of the Pearl Harbor Aquifer **Sector** is 184 MGD which consists of 119 MGD for Waipahu-Waiawa **aquifer system**, 20 MGD for Ewa Kunia **aquifer system** and 45 MGD for Waimalu **aquifer system** which includes the return flow of irrigation pumped ground water and Waiahole water in the Waipahu-Waiawa and Ewa-Kunia aquifer systems. (Mink Tr. 1/10/96 at 77, line 142). [KSBE FOF239, WIC FOF413]

633. The Waipahu-Waiawa and the Ewa-Kunia aquifer systems are affected by Waiahole Ditch water. A change in the **[distribution of Waiahole Ditch] amount of irrigation** water will affect the sustainable yields of these systems. (Lao Tr. 1/09/96 at 61-62). [KSBE FOF240, WIC FOF414]

634. Waiahole Ditch water was not used east of Waiawa valley and therefore the 45 MGD sustainable yield for the Waimalu area is not affected by Waiahole Ditch water. (Lao Tr. 1/9/96 at 61, lines 20-25; at 62, line 1). [KSBE FOF241, WIC FOF415]

635. The use of Waiahole Ditch water for irrigation increases the sustainable yield because it is an external source from outside the Pearl Harbor system. **[In contrast, use of pumped well water decreases the available sustainable yield because it comes from within the same system.]** (Mink Tr. 1/10/96 at 153). [KSBE FOF242, WIC FOF416]

636. [The] **Mink believes that the** sustainable yield of the Pearl Harbor aquifer **sector** should be reduced to an amount that does not include recharge from past irrigation of sugar cane or future irrigation practices since the recoverable portion from diversified agriculture is not known. Then, once verified, the sustainable yield could be increased to account for return flow. (Mink Tr. 1/10/96 at 76, lines 1-3; 4/17/96 at 116, lines 21-25; at 117, lines 1-7). [KSBE FOF244, WIC FOF418]

637. [The] **Mink stated that the** sustainable yield of the Koolau aquifer without return irrigation of sugar cane is 140 MGD at an equilibrium head of 19 feet and of

the Ewa Kunia aquifer is 11 MGD at an equilibrium head of 14 feet for a total of 151 MGD. (Mink Tr. 1/10/96 at 76, lines 5-11; at 105, lines 12-25). [KSBE FOF245, WIC FOF419]

638. [Twenty-five] **Mink stated that** (25) MGD of water if used to irrigate diversified agriculture over the Pearl Harbor aquifer will provide recharge of 10 MGD, at 40% of applied water, which will increase the sustainable yield of the combined Koolau-Ewa Kunia aquifer by seven (7) MGD from 151 MGD to 158 MGD. (Mink Tr. 4/17/96 at 132, lines 9-19). [KSBE FOF246, WIC FOF420]

639. Deducting the 1994 permitted uses of 124 MGD by BWS, Navy and private users, not including agriculture, from the 158 MGD leaves thirty-four (34) MGD available for other uses. If Waiahole Ditch water is not available and twenty-five (25) MGD of Pearl Harbor ground water is allocated for irrigation of diversified agriculture, there will be 9 MGD available for municipal uses. (Mink Tr. 4/17/96 at 133-134). [KSBE FOF247, WIC FOF421]

640. [Eighteen] **Mink stated that eighteen** (18) feet, which is one-half the original equilibrium head, is a safe head based on operational experience in the Pearl Harbor Aquifer **Sector**. (Mink Tr. 01/10/96 at 136, lines 15-23) If you reduce the equilibrium head, the bottom of the lens moves up and many of the [producible] **production** wells **may** become unusable because of salinity. (Mink Tr. 01/10/96 at 137, lines 1-9) [KSBE FOF248, WIC FOF422]

641. Increasing the sustainable yield by reducing the equilibrium head would come at a cost of resiting wells to maintain adequate water quality and reduction in the Pearl Harbor Spring flows which are a critical part of the Pearl Harbor environment. (Mink Tr. 1/10/96 at 105, lines 20-25; at 108, lines 1-3). [KSBE FOF249, WIC FOF423]

#### **4. Recharge**

642. Recharge is an integral part of the hydrologic cycle and a significant factor in the determination of sustainable yield. (Lao WDT 9/18/95 at 25, paragraph 80). [KSBE FOF250, WIC FOF397]

643. Recharge is derived from water that percolates down to the groundwater body from rainfall and water applied in excess of plant needs. (Lao Tr. 1/09/96 at 63, lines 3-25; at 64, lines 1-4). [KSBE FOF251, WIC FOF398]

644. The Pearl Harbor [basal] aquifer **sector** of Central Oahu is partially recharged by the flows of the Waiahole Ditch system, by irrigation return[ed] water from sugar

cane lands cultivated by Oahu Sugar Company and currently from irrigation return[ed] water from existing diversified ag use on the Leeward side of the Koolau crest. Lum, Tr., 12/13/95, P168. [WIC FOF388]

645. Lysimeter studies have shown that the water percolates beyond the root zone into the basalt and accumulates in the groundwater aquifer. (Mink Tr. 1/10/96 at 83, lines 9-14). [KSBE FOF252, WIC FOF399]

646. **[Forty] The Commission received testimony that forty** to sixty percent of all water applied to agricultural lands through furrow irrigation of sugar cane recharged the underlying Pearl Harbor aquifer. (Lao Tr. 1/09/96 at 63, lines 3-12; Mink Tr. 1/10/96 at 83, lines 19-20; Giambelluca Tr. 2/21/96 at 188, lines 1-2). [KSBE FOF253]

647. **[Thirty] The Commission received testimony that** to forty percent of all water applied to agricultural lands through drip irrigation of sugar cane recharged the underlying Pearl Harbor aquifer. (Mink Tr. 1/10/96 at 83, lines 21-22; Giambelluca Tr. 2/21/96 at 188, lines 18-20). [KSBE FOF254]

648. **The Commission received testimony that** Waiahole Ditch water applied to sugar cane by drip irrigation resulted in a recharge of the Pearl Harbor aquifer of approximately 7.5 to 12 MGD. (Giambelluca Tr. at 188, line 25; at 189, line 1; Mink Tr. 1/10/96 at 7, lines 19-24; Lao Tr. 1/09/96 at 65, lines 11-15). [KSBE FOF255]

649. **[Estimated] Giambelluca stated that** recharge from diversified agriculture is 30 to 60 percent of applied water, with an average of 40%. (Giambelluca Tr. 2/21/96 at 189, lines 10-21; Lao Tr. 1/10/96 at 111, lines 15-22). [KSBE FOF256, WIC FOF402]

650. **[Twenty-five] Giambelluca stated that twenty-five** (25) MGD of applied water for irrigation of diversified agriculture **[would] could** provide 10 MGD of additional recharge to the aquifer. (Giambelluca Tr. 2/21/96 at 189, lines 22-24). [KSBE FOF257, WIC FOF403]

651. Mink testified that diversified farming more nearly approximates lysimeter studies than plantation agriculture. The studies alone have recharge down to around 20 to 25 percent of the applied water. That would probably be the magnitude of recharge from diversified agriculture. (Mink Tr. 4/17/96 at 127, lines 15-21). [CWRM FOF18]

652. Consideration to the quality of the recharge water must be given for any

recharge that takes place over the Pearl Harbor Aquifer. (Giambelluca Tr. 02/21/96 at 197, lines 2-5) [KSBE FOF258, WIC FOF404]

653. Recharge from the Waiahole Ditch water increases the allowable net draft from the aquifer whereas **recharge from** pumped groundwater from within the system does not. (Mink Tr. 1/10/96 at 153, lines 13-23). [KSBE FOF259, WIC FOF405]

654. Irrigating with high quality non-potable Waiahole Ditch water over the Pearl Harbor aquifer **could** recharge[s] the aquifer, increase[s] the sustainable yield and improve[s] the water quality of the aquifer. Sato, Tr., 1/9/96, P19/L13-20; Hara, Tr., 11/21/95, P64/L7-14. [WIC FOF406]

655. The water balance approach **to estimating sustainable yield** involves using measurements of the principal components of the hydrologic cycle, especially rainfall, irrigation, runoff, potential evaporation, and takes into consideration the characteristics of the land surface especially the amount of vegetation cover of the soil, hydrologic properties and any effects of urbanization. **Giambelluca** Tr. February 21, 1996 at v. II, p. 186, l. 18-23. [OHA FOFII.A.1.]

656. Recharge to the Pearl Harbor **(includes the Waipahu-Waiawa and Waimalu aquifer systems)** and Ewa-Kunia aquifers from the Windward O'ahu ground and surface water is much less than the loss of groundwater in those aquifers that occurred when the groundwater was pumped for irrigating sugar cane. The cessation of the irrigation of sugar in the Kunia region by that pumped water and the Windward O'ahu ground and surface water results in a net gain to the aquifer. According to the U. S. Geological Survey office, the natural recharge (not including recharge from pumped water or Windward O'ahu ground and surface water) to the Pearl Harbor and Ewa- Kunia aquifers is approximately 237 mgd on the average. Recharge from the Windward O'ahu ground and surface water (if all of the estimated 25 mgd were used as irrigation water over those aquifers) would increase the total recharge to approximately 247 mgd. Windward O'ahu ground and surface water would make up about 4% of that total recharge. October 10, 1995 letter from William Meyer, district chief of the Hawai'i District of the U. S. Geological Survey, attached as Exhibit A to Declaration of Arnold L. Lum, Esq., October 12, 1995. [OHA FOFII.A.7.]

657. A reduction in recharge from irrigation would reduce the **[possibility of]** leaching of pesticides and nutrients. The main route for agricultural chemicals to contaminate groundwater is through leaching down through soil horizons through recharge. **Freeman**, Tr. March 6, 1996 at pp. 11-12, ln. 15-25, 1-10. [OHA FOFII.A.10.]



658. Organic pesticides degrade over time, and thus the longer the time it takes for the pesticide to get to the ground water, the more time it has to break down into a less toxic component. *Id.* at p. 12, ln. 18-25. [OHA FOFII.A.11.]

659. Pesticide and herbicide contamination of groundwater through leaching poses a significant threat to the groundwater without proper precautions. *Id.* at pp. 11-12, ln. 19-25, 1-4. [OHA FOFII.A.12.]

660. A higher irrigation efficiency allows chemicals applied to crops to stay on the crop and in the soil, rather than leaching out. Higher recharge rates force farmers to apply more chemicals to achieve the same degree of protection, as the high rates allow the chemical to go past the root zone, where it is no longer functional. Thus, lower recharge rates minimize the use of chemicals and thus the cost of chemicals to the farmer. *Id.* at p. 13, ln. 1-13. [OHA FOFII.A.13.]

## **5. Windward Area Stream Flow**

661. The Hawaii Stream Assessment (HSA) lists and ranks these windward Oahu streams which may be affected by the Waiahole Ditch system as follows:

### **a. Kahana Stream**

Code:	3-1-18
Continuous:	Stream flows to the sea year-round
Tributary:	Stream has tributaries in HSA database
Dam or Diversion:	No known dam or diversion weir
Aquatic Resources:	Outstanding
Riparian Resources:	Native forest = 10%
Cultural Resources:	Sensitivity = High
Recreational Resources:	Outstanding

### **b. Hakipuu Stream**

Code:	3-2-01
Continuous:	Stream flow to the sea year-round
Tributary:	Stream has no tributaries in HSA database
Dam or Diversion:	Dam or diversion weir noted
Aquatic Resources:	Moderate
Riparian Resources:	Native forest = 0%

Cultural Resources:	Sensitivity = Moderate
Recreational Resources:	Limited

c. Waikane Stream

Code:	3-2-02
Continuous:	Stream flow to the sea year-round
Tributary:	Stream has no tributaries in HSA database
Dam or Diversion:	Dam or diversion weir noted
Aquatic Resources:	Moderate
Riparian Resources:	Native forest = 0%
Cultural Resources:	Sensitivity = Moderate
Recreational Resources:	Substantial

d. Waianu Stream

Code:	3-2-03
Continuous:	Stream flow to the sea year-round
Tributary:	Stream has no tributaries in HSA database
Dam or Diversion:	Dam or diversion weir noted
Aquatic Resources:	Not rated
Riparian Resources:	Native forest = 0%
Cultural Resources:	Sensitivity = Moderate
Recreational Resources:	Moderate

e. Waiahole Stream

Code:	3-2-04
Continuous:	Stream flows to the sea year-round
Tributary:	Stream has tributaries in HSA database
Dam or Diversion:	Dam or diversion weir noted
Aquatic Resources:	Moderate
Riparian Resources:	Native forest = 0%
Cultural Resources:	Sensitivity = Moderate
Recreational Resources:	Substantial

[CWRM FOF19]

662. Stream flow is the result of rain runoff and groundwater flow. (Lum Tr. 04/24/96 at 23, lines 22-25; at 24, lines 1-3). During periods of low rainfall, the stream flow will diminish to a seasonal low point which is known as the base flow of a stream. (Lum Tr. 04/24/96 at 24, lines 4-9). [KSBE FOF267]

663. Q-90 stream flow is a statistical measure which indicates the frequency at which a stream flow equals or exceeds a certain flow during a certain period of time. (Lum Tr. 04/24/96 at 23, lines 2-12). The Q-90 value is dependent upon the time period examined, so Q90 values for a particular stream at a particular gauging point will vary depending upon the time period examined or with the length of the time period. (Lum Tr. 04/24/96 at 23, lines 13-16). [KSBE FOF268]

664. The base flow isolates the groundwater component of stream flow. (Lum Tr. 04/24/96 at 54, lines 23-25; at 55 lines 1-11). The changes to Windward streams under pre- and post-Waiahole Ditch conditions are best determined by examining the base flow of a stream[.], (Lum Tr. 04/24/96 at 24, lines 4-9), because Waiahole Ditch is essentially developing groundwater. (Lum Tr. 04/24/96 at 55 lines 11-18). [KSBE FOF269]

665. The gain in stream flow in the lower portions of the stream, i.e. 8.1 MGD at 750' increased to 11.5 MGD at 250', is caused by water fed from dikes which were not disturbed by the Waiahole Ditch tunnel. (Lum Tr. 04/24/96 at 42, lines 12-25; at 43, lines 1-15). The Waiahole Ditch penetrates the dike structure above the 400' elevation (Lum Tr. 04/24/96 at 44, lines 14-21). Below the 400' elevation the dike structures in the Waiahole-Waikane drainage basin are covered with a layer of impermeable sediment which acts as a dam confining the water in the dike compartments. (Lum Tr. 04/24/96 at 44, lines 14-21). The dike water can only leak out [a] at lower elevations and eventually contribute to the stream flow. (Lum Tr. 04/24/96 at 44, lines 14-21). [KSBE FOF271]

666. Hakipu'u Stream does not originate in the Koolau Crest. Most of the stream lies below the 400' elevation. Therefore, while it is possible Waiahole Ditch could affect Hakipu'u Stream, the effects would not be as significant as on the Waiahole Stream. (Lum Tr. 04/24/96 at 52, lines 23-25; at 53, lines 1-8) [KSBE FOF276]

667. The Waiāhole Ditch depleted dike storage over many years. Ex. A-R-101. [WWCA FOF459]

668. The Waiāhole Ditch development tunnels, by tapping into the dike storage, had a "dampening effect," evening out the seasonal variability in the Ditch flow that would otherwise accompany the seasonal variation in rainfall. Bert Hatton, April 10, 1996, p. 111, ll. 9-13; p. 128, ll. 7-16. [WWCA FOF460]

669. The Waiāhole Ditch development tunnels reduced seasonal variability in the Ditch at the expense of stream base flow, particularly during the summer. Bert Hatton, April 10, 1996, p. 128, ll. 24-25; p. 129, ll. 1-4; Daniel Lum, April 24, 1996, p. 78, ll. 8-12. [WWCA FOF462]

670. The lowering of the head in the dikes as a result of the development tunnels may have caused springs and seeps below the level of the Ditch - which previously fed the streams - to dry up. Daniel Lum, April 24, 1996, p. 42, ll. 18-25; p. 43, ll. 10-15; p. 77, ll. 6-12. [WWCA FOF463]

671. The Uwau Tunnel gained 2.8 mgd in baseflow as a result of the extension. William Meyer, April 16, 1996, p. 9, ll. 13-25; p. 10, ll. 1-9. [WWCA FOF466]

672. The Uwau extension reduced the baseflow of Waiāhole, Waianu, and Uwau streams by 2.8 mgd. William Meyer, April 16, 1996, p. 12, ll. 19-25; p. 13, ll. 1-4. [WWCA FOF467]

673. The 2.8 mgd diversion by the Uwau extension represented one-third to one-half of the total baseflow of the streams at that time, and the drop in flow would have been noticeable to the naked eye. William Meyer, p. 10, ll. 8-10, 21-25; p. 11, ll. 1-25; p. 12, ll. 1-6. [WWCA FOF468]

## **6. Quantity of Water for Windward Uses**

674. The quantity of water available for Windward uses is as follows:

a. Approximately 42 mgd on average from Windward streams as follows:

	<u>Average (mgd)</u>
Waiahole (Site 178)	6.9
Waianu	1.2
Waikane	4.2
Kahana	<u>29.5</u>
Total average flow	<u>41.8</u> mgd

Ex. M-36A, P40.

b. 1 mgd from the two wells in Waiahole Agricultural and Residential Park operated by HFDC which supplies both domestic and irrigation water. It is currently underutilized and is supplying only less than 100,000 gpd. Lao, Tr., 1/09/96, P81/L10-13; McElroy, Tr., 4/16/96, P97.

c. .5 mgd from the McCandless pipeline. [WIC FOF335]

675. The Hoes currently have enough water in Hakipu'u to grow their taro. K. Ray Hoe, 4/3/96, P75/L2-5. [WIC FOF340]

676. The Taro Institute does not know how much water it would take to satisfy its needs. K. Ray Hoe, 4/3/96, P96/L2-4. [WIC FOF344]

## **G. Reclaimed Water**

The use of reclaimed wastewater is one way of extending our remaining resources by utilizing lower quality water for irrigation purposes, in place of higher quality ground water. Section G discusses the treatment methods, the DOH guidelines for treatment and reuse, concerns of various agencies, various studies that have been conducted, some reuse projects, and the cost impacts of treating and using wastewater effluent.

### **1. Wastewater Treatment Methods**

677. In order to reclaim wastewater for reuse, the wastewater must be treated to render it safe for the intended use. The treatment must be adequate to protect public health and to prevent adverse environmental impacts. (Honke Tr. 1/30/96 at 122, lines 19-22). [KSBE FOF379]

678. Sewage plant engineers generally refer to three (3) levels of wastewater treatment: primary, secondary, and tertiary treatment. (Honke Tr. 1/30/96 at 123, lines 11-13). [KSBE FOF381]

679. Primary treatment is the physical treatment of effluent to remove solid particles from the sewage through screening and gravity settling in sedimentation tanks called primary clarifiers. (Honke Tr. 1/20/96 at 124, lines 1-7). [KSBE FOF382]

680. Secondary treatment, a biological process (i.e., digestion by microorganisms), is intended to remove the fine and dissolved organic matter that are not removed in the primary treatment stage. (Honke Tr. 1/30/96 at 125, lines 2-10). [KSBE

FOF383]

681. Tertiary treatment is used to remove substances that are not removed by the primary and secondary processes. Tertiary treatment can consist of processes to remove nutrients such as nitrogen and phosphorous from the effluent. (Honke Tr. 1/30/96 at 126, lines 15-23). [KSBE FOF384]

682. If salts are to be removed from the effluent a treatment process such as reverse osmosis has to be added. (Honke Tr. 1/30/96 at 127, lines 10-12). [KSBE FOF385]

683. R-1 reclaimed water: significant reduction in viral and bacterial pathogens; R-2 reclaimed water: disinfected secondary treated reclaimed water with a fecal coliform limit of 4cfu/100mil; R-3 reclaimed water: undisinfected secondary treated reclaimed water. (Guidelines for the Treatment and Use of Reclaimed Water, pp. 13-14). [CWRM FOF20]

## **2. Guidelines for Reuse**

684. DOH advocates wastewater reuse, but only if it would not compromise public health or environmental quality. Therefore, in 1993 DOH established extensive Guidelines for the Treatment and Use of Reclaimed Water ("DOH Guidelines") which address acceptable treatment methods and applications for the use of reclaimed water. (Anderson Tr. 2/1/96 at 129, lines 10-17; Exhibit T-124). [KSBE FOF388]

685. The guidelines differentiate between various levels of treatment including: R-1 water which is the highest quality of treated wastewater with a high level of disinfection and least restrictive in its application; R-2 water which is secondary treated effluent with less disinfection than R-1 water and is the most common level of treatment from wastewater plants throughout the State of Hawaii; and R-3 water which is secondary treated effluent with no disinfection. (Anderson Tr. 2/1/96 at 129, lines 14 and 22 through 130). [KSBE FOF389]

686. DOH Guidelines limit use of reclaimed water for irrigating certain types of food products. R-2 water cannot come in contact with the edible portion of any food crop unless the food subsequently undergoes extensive **[commercial]** physical or chemical processing such as **with** sugar cane. (Anderson WDT at 3, lines 21-25; Tr. 2/1/96 at 13, lines 5-8). [KSBE FOF393]

687. According to the Department of Health's existing Guidelines for the Treatment and Use of Reclaimed Water, R-2 level reclaimed water may be used for, among other uses, subsurface irrigation of golf courses, landscaping and turf at parks

and elementary school yards, and banana and papaya trees. Ex. L-400, Item 2. [WWCA FOF65]

688. R-2 water is approved for use with any form of irrigation of fodder crops, seed crops, and cemetery landscaping - each of which is among the proposed uses for Waiāhole water. Ex. L-400, Item 2. [WWCA FOF66]

689. **[R-2 water is already being used] Del Monte mixes approximately 30,000 gallons per day of secondary treated wastewater from Kunia Village with its other irrigation waters** to drip irrigate pineapple on Oahu. Tim Steinberger, January 31, 1996, p. 174, ll. 2-20. [WWCA FOF68]

690. The Wahiawā and Schofield Barracks wastewater treatment plants currently produce R-2 water. Ex. A-201, Engineering Evaluation, Belt Collins Hawai‘i, September 1995, p. 4-2. [WWCA FOF70]

691. The same effluent that could be used/being proposed for use in Kunia - from the Wahiawā and Schofield Barracks wastewater treatment plants - has been **diluted with surface water and** used for sugarcane irrigation over the potable Waialua aquifer for 70 years. The Department of Health has not found any impact on the groundwater, despite having monitored the water in the Waialua aquifer since the 1960s. Bruce Anderson, February 1, 1996, p. 134, ll. 5-9 and 24-25; p. 135, ll. 1 and 10-13; p. 150, ll. 22-25; p. 151, l. 1; Bruce Anderson, February 6, 1996, p. 16, ll. 8-10. [WWCA FOF76]

692. The reclaimed water used for sugarcane irrigation at Waialua has never been as highly treated as **[pathogen-free]** R-1 water would be. For the last 35 years, R-2 water has been used in Waialua, and, for the three decades before that, primary-treated R-3 water was used. James Honke, January 30, 1996, p. 172, ll. 10-23. [WWCA FOF77]

693. The same agricultural pesticides that have been detected in the Pearl Harbor aquifer - such as DBCP and TCP - have also been found in the Waialua aquifer at similar levels. Bruce Anderson, February 6, 1996, p. 18, ll. 11-25; p. 19, ll. 1-18; Ex. N-83, Hawai‘i Water Quality Plan, 1992 Draft, p. III-16; Ex. N-178. [WWCA FOF78]

694. According to the Hawai‘i Water Quality Plan, Appendix C, pp. 13 and 17, the Waialua aquifer is considered hydrologically "highly vulnerable to contamination." Bruce Anderson, p. 22, ll. 4-25; p. 23, ll. 1-25; p. 24, ll. 1-12; Ex. N-83. [WWCA FOF79]

695. Dr. Bruce Anderson, Department of Health, is aware of information that suggests a difference in the Waialua and Pearl Harbor aquifer, in terms of vulnerability to contamination. (Bruce Anderson, 2/6/96. p. 16, lines 8-25; p. 20, lines 5-25; p.21, lines 7-22; p. 24, lines 23-25; p. 25, lines 1-12; p. 26, lines 2-6). [CWRM FOF21]

696. A report on water reclamation, prepared by Dr. James Kumagai for the Commission on Water Resource Management **and the Division of Wastewater Management (DWWM)**, notes the use of reclaimed water to irrigate raw vegetable crops (including lettuce), and that research has shown the risks of such irrigation to be **low and** insignificant. Ex. N-130, p. 6. [WWCA FOF99]

697. The only party to this proceeding that **[has sought to use]** **uses** reclaimed water to irrigate crops over the Pearl Harbor aquifer is Del Monte, which uses **[R-2] secondary-treated** water **diluted with its other irrigation water** to irrigate pineapple in Kunia. Tim Steinberger, January 31, 1996, p. 174, ll. 2-20. [WWCA FOF103]

698. Del Monte's use of **[R-2] secondary treated** water **diluted with its other irrigation water** to irrigate pineapple in Kunia is done with the Department of Health's approval. Ex. N-176, letter dated March 15, 1990 from the Department of Health to Del Monte; Ex. N-177, letter dated June 8, 1995 from the Department of Health to Wai Engineering, Inc.; **Steinberger, January 31, 1996, p.174, lines 7-20.** [WWCA FOF104]

699. Del Monte is using reclaimed water **diluted with its other irrigation water** in spray irrigation with the Department of Health's knowledge and encouragement. Ex. 176, March 15, 1990 letter from James Ikeda to W.F. Schell. [WWCA FOF111]

700. Dr. James Kumagai's report on water reclamation prepared for the Commission on Water Resource Management **and the DWWM** discusses the inevitable need to reclaim and reuse water **[in Central and Leeward O'ahu,]** and recommends that the time to start doing so is now, before a water crisis develops. Ex. N-130, p. 10. [WWCA FOF113]

### **3. Agency Responsibilities and Concerns**

701. Wastewater Management ("WWM") administers the planning, design, and construction of wastewater facilities; oversees the operation and maintenance of sewer lines, treatment plants, and pumping stations and monitors the collection, treatment, and disposal of wastewater. (Limtiaco Tr. 1/30/96 at 7, lines 1-11). [KSBE FOF380]



702. BWS has been concerned about preventing contamination of the Pearl Harbor Aquifer and created a Pass/No-Pass line in 1976 to advocate protection of the aquifer. (Lao Tr. 1/9/96 at 76, lines 2-6; at 89, lines 22-25; Exhibit T-92). [KSBE FOF370]

703. BWS is concerned about the presence of substances such as nutrients, nitrates, chlorides and total dissolved solids in reclaimed water as it relates to groundwater contamination of the underlying aquifer. (Kawata Tr. 01/11/96 at 179, lines 12-17) [KSBE FOF372]

704. BWS has also found elevated levels of volatile organic chemicals in its Pearl Harbor wells from use of pesticides on pineapple 20 years ago which required BWS to install granular activated carbon treatment on its wells. (Kawata WDT 9/18/95 at 17). [KSBE FOF374]

705. The major concern for Honouliuli effluent applied in the No-Pass Zone is the impact of the excessive salinity in the potable water. (Lao Tr. 1/9/96 at 78, lines 9-11). [KSBE FOF375]

706. BWS supports use of reclaimed water over the Ewa caprock aquifer which supplies nonpotable water. (Sato Tr. 1/9/96 at 21, lines 23-25). [KSBE FOF377]

707. Reclaimed effluent is suitable for use over the nonpotable Ewa caprock aquifer because it is hydrologically separate from the basal aquifers. (Lao Tr. 1/9/96 at 77, lines 22-25; at 78, lines 1-3). [KSBE FOF378]

708. The State of Hawaii Department of Health ("DOH") has the authority to protect drinking water, regulate wastewater disposal, and control water pollution through delegation agreements with EPA. (Anderson Tr. 2/1/96 at 128, lines 21-24). [KSBE FOF386]

709. EPA has no rules or guidelines for wastewater reuse. In Hawaii, DOH regulates wastewater reuse. (Anderson Tr. 2/1/96 at 129, lines 3-9). [KSBE FOF387]

710. DOH has two (2) concerns with respect to the use of effluent: the contamination of groundwater by nitrates and dissolved solids, particularly chlorides, and health risks associated with direct or indirect exposure to sewage effluent. (Exhibit L-4 at 4; Anderson Tr. 2/1/96 at 130, lines 19-25; at 202, lines 15-17). [KSBE FOF390]

711. DOH does not support the use of reuse water to irrigate fresh vegetables which are intended to be consumed raw. Effluent can be used for growing bananas

or papayas where there is no direct contact with the fruit. (Anderson Tr. 2/1/96 at 166, lines 21-22). [KSBE FOF394]

712. Restrictions with the use of R-1 water would include: (1) that irrigation shall not exceed the consumptive rate, (2) limits on the total dissolved solids and nutrient concentrations in the reclaimed water and the percolate, and (3) an evaluation of the long-term effects on groundwater quality. (Anderson Tr. 2/1/96 at 131, lines 22-25; at 132, lines 1-9). [KSBE FOF397]

713. DOH would require reclaimed water users such as farmers to use lysimeters to monitor the consumptive use of the plants and monitoring wells to determine the impacts of any filtration into the groundwater over a potable water aquifer. (Anderson Tr. 2/1/96 at 142-43; Honke Tr. 2/1/96 at 144, lines 2-11). [KSBE FOF398]

714. Any malfunction or leakage of transmitted reuse water would be required to be reported as a sewage spill. Monitoring or clean up may be required. (Anderson Tr. 2/1/96 at 185, lines 1-21). [KSBE FOF399]

715. DOH supports the use of reclaimed water for irrigation below the H-1 freeway over the Ewa nonpotable caprock aquifer where the groundwater is not used for drinking water purposes. (Anderson WDT 9/18/95 at 5, lines 5-8). [KSBE FOF400]

716. There is a lot of demand for wastewater in the Ewa Plain Area where a number of golf courses are being developed. (Anderson Tr. 2/1/96 at 139, lines 20-24). [KSBE FOF401]

717. DOH and BWS have two objections to the use of reclaimed water in Central Oahu. First, DOH and BWS object to the use of reclaimed water over potable aquifers until more information is obtained about the potential effects of reclaimed water use over potable aquifers. Second, transportation of the reclaimed **water** from the Honouliuli waste water treatment plant ("WWTP") at a lower elevation of 45 feet mean sea level to the upper elevations, which range from 600 to 800 feet, would be costly to construct, operate, and maintain. Steinberger, Tr., 1/31/96, P48/L9-21. [WIC FOF369]

#### **4. Reuse Studies**

718. Three (3) sugar cane reuse studies, two (2) on furrow and one (1) on drip tube irrigation, were conducted to determine the effect on sugar cane growth and the potential impact on groundwater quality. Subsequent studies were also done on

irrigation of California grass and recharge of the Ewa caprock aquifer with Honouliuli primary effluent. (Nagamine Tr. 1/31/96 at 9, lines 1-10). [KSBE FOF408]

719. The sugar cane reuse studies were conducted by The University of Hawaii Water Resources Research Center ("UH-WRRC") with support from the City Department of Public Works, BWS, Hawaii Sugar Planters Association, OSCO, and DOH. (Nagamine Tr. 1/31/96 at 9, lines 11-16). [KSBE FOF409]

720. The sugar cane reuse studies were conducted at the old Mililani sewage treatment plant and in OSCO Field 246. (Nagamine Tr. 1/31/96 at 9, lines 14-16). [KSBE FOF410]

721. The first furrow irrigation study was entitled "Recycling of Sewage Effluent by Irrigation: A Field Study on Oahu." (Nagamine Tr. 1/31/96 at 9, line 24; at 10, line 1; Exhibit T-131). [KSBE FOF411]

722. The study began in 1971 with field testing over a two-year crop cycle from 1973 to early 1975. There were thirty (30) field test plots, located in OSCO Field 246. The quality of the effluent ditch water and the percolate were monitored and cane tonnage and sugar yield were measured. (Nagamine Tr. 1/31/96 at 10, lines 14-23). [KSBE FOF412]

723. This study did not monitor groundwater and recommended that a virus monitoring program be established for any full-scale reuse. (Nagamine Tr. 1/31/96 at 11, lines 13-15). [KSBE FOF413]

724. The study recommended irrigating sugar cane with undiluted sewage effluent in only the first year of the two-year crop cycle and with only fresh water the second year so that cane yields are not affected. However, plantations have only a single ditch water system. (Honke Tr. 1/31/96 at 136, lines 1-10). [KSBE FOF414]

725. To allow use of the existing single ditch water system, the second study investigated sugar yields resulting from the application of various dilutions of effluent and ditch water. (Nagamine Tr. 1/31/96 at 11, lines 23-25). [KSBE FOF415]

726. The second furrow irrigation study entitled "Recycling of Sewage effluent By Sugarcane Irrigation: A Dilution Study-Phase II-A," was conducted from 1976 to 1978. The objective of this study was to determine the dilution with Waiahole Ditch water necessary for optimal sugar yield when chlorinated secondary treated sewage was used for irrigation of sugar cane. (Exhibit T-132 at 4). [KSBE FOF416]

727. Chlorinated secondary treated sewage from the Mililani plant and ditch water were applied at various dilutions to replanted sugar cane in the same thirty (30) field test plots as in the first study. (Nagamine Tr. 1/31/96 at 12, lines 7-10). [KSBE FOF417]

728. UH-WRRC recommended limiting the effluent content to twenty-five percent (25%) or less over the two-year crop cycle so that cane yields are not affected. (Honke Tr. 1/30/96 at 136, lines 1-10; Nagamine Tr. 1/31/96 at 12, lines 18-21). [KSBE FOF418]

729. Since plantations were converting from furrow irrigation to drip tube irrigation, in 1977, UH-WRRC began the third project to study drip tube irrigation using secondary effluent. This third study was entitled "Post Secondary Treatment of Effluent for Drip Irrigation." (Nagamine Tr. 1/31/96 at 13, lines 2-6; Exhibit T-133). [KSBE FOF419]

730. Plugging of drip tubes with suspended matter and microorganisms in effluent was of concern, so the objective was to determine methods of further treating secondary effluent such that it could be used in drip tubes with less than ten percent (10%) plugging. [KSBE FOF420]

731. A pilot drip tube farm was installed at the Mililani sewage treatment plant. Various dilutions of effluent were treated with screens, filters, and **[chlorinated] chlorine** and tested in drip tubes. There was no sugar cane irrigated or tested in this project. (Nagamine Tr. 1/31/96 at 13, lines 13-19). [KSBE FOF421]

732. The study demonstrated that diluted secondary effluent could be further treated and used in drip tubes with less than ten percent (10%) plugging. (Nagamine Tr. 1/31/96 at 14, lines 5-7). [KSBE FOF422]

733. From April 1979 to August 1980, a study of effluent irrigation of California grass was conducted on test plots at the old Mililani Treatment Plant and was undertaken by UH-WRRC. The study was entitled "Irrigation of California Grass with Domestic Sewage Effluent." (Nagamine Tr. 1/31/96 at 14, lines 10-14; Exhibit T-134). [KSBE FOF423]

734. The objective was to determine if irrigation of California grass with sewage effluent was an environmentally sound method of effluent disposal and whether a usable crop could be produced. (Nagamine Tr. 1/31/96 at 14, lines 15-23). [KSBE FOF424]

735. Chlorinated secondary sewage, tap water, and fifty percent (50%) effluent

were used to irrigate California grass in test plots on the Mililani Treatment Plant grounds. The test plots totaled about 600 square feet in area. (Nagamine Tr. 1/31/96 at 14, line 24; at 15, line 2). [KSBE FOF425]

736. The study concluded that irrigation of California grass is an effective means of removing nitrogen from domestic sewage effluent and produces a crop suitable for feeding dairy cattle. Approximately sixty-nine percent (69%) of the nitrogen was removed by plant uptake. (Nagamine Tr. 1/31/96 at 15, lines 6-14). [KSBE FOF426]

737. From 1986 to 1988, UH-WRRC conducted a research project to test recharge of the Ewa caprock aquifer by irrigating sugar cane and California grass with chlorinated primary effluent from the Honouliuli WWTP. The study was entitled "Groundwater Recharge with Honouliuli Wastewater Irrigation: Ewa Plain." (Nagamine Tr. 1/31/96 at 15, lines 16-22; Anderson Tr. 2/6/96 at 17, lines 3-9; Exhibit T-128). [KSBE FOF428]

738. Chlorinated primary effluent and fresh water were used to spray and flood irrigate sugar cane and California grass at that project site. Quality of the effluent, the percolate, the groundwater, and also air quality were monitored. (Nagamine Tr. 1/31/96 at 16, lines 18-25). [KSBE FOF429]

739. The study concluded that recharge of the Ewa caprock aquifer was viable and the most accepted method was border flooding of California grass. (Nagamine Tr. 1/31/96 at 17, lines 4-7). [KSBE FOF430]

740. The data from the studies which were conducted on sugar cane are not transferable to other types of crops such as vegetable crops because of concern about nutrients contaminating ground water if the crop did not take up the applied nutrients. (Limtiaco Tr. 1/30/96 at 75, lines 14-25; at 76, lines 1-6). [KSBE FOF431]

741. To assess the soil treatment efficiency and groundwater quality, comprehensive long-term monitoring must be an integral part of any future reuse or recharge program. (Nagamine Tr. 1/31/96 at 18, lines 5-7). [KSBE FOF432]

## **5. Honouliuli WWTP**

742. DOH would not approve of use of primary effluent for irrigation; therefore, the City embarked on constructing secondary facilities at the Honouliuli WWTP, since all options for reuse would require a secondary treatment process. (Honke Tr. 1/30/96 at 134, lines 13-16). [KSBE FOF433]

743. In 1989, WWM requested funds to plan and design a 13 MGD secondary treatment unit at the Honouliuli WWTP. The funds were appropriated by the City Council and the work began in 1991. (Honke Tr. 1/30/96 at 134, lines 17-21). [KSBE FOF434]

744. The 13 MGD size was selected because the plant increments for expansion are of that size and it matched closely with an earlier BWS estimate of a nonpotable water need of about 12.5 MGD in the Ewa area. (Honke WDT 9/18/95 at 15-16, paragraph 26). [KSBE FOF435]

745. Construction of the 13 MGD secondary unit is scheduled for completion by December 1996. (Honke Tr. 1/30/96 at 134, lines 20-22). [KSBE FOF436]

746. When the 13 MGD secondary unit is completed, the Honouliuli WWTP will produce **[R-3] R-2** water. In order to produce R-2 water, **additional** disinfection and filtration equipment must be constructed. (Limtiaco Tr. 1/30/96 at 62, lines 12-17; at 63, lines 10-12). [KSBE FOF437]

## **6. Reuse Projects**

747. In 1995, the City entered into a Consent Decree with the United States Environmental Protection Agency ("EPA") to promote and implement effluent reuse projects on Oahu to beneficially use up to 10 million gallons of reclaimed water per day within 6 years. (Steinberger Tr. 1/31/96 at 45, lines 10-14). [KSBE FOF438]

748. The City's commitment is to reuse 2.0 MGD of effluent by August 1998, an additional 3.0 MGD by August 1999, and a total of 10.0 MGD from July 2001 and thereafter for a period of 10 years. (Limtiaco Tr. 1/30/96 at 12, lines 18-22). [KSBE FOF439]

749. In order to comply with the agreements made with the EPA regarding the reuse of treated wastewater, WWM must develop and implement a reuse program that (1) falls within the agreed time line; (2) does not exceed the CIP budget limitation set by City Council; (3) falls within the current DOH reuse guidelines; and (4) meets the City and County Charter requirements for wastewater management. (Steinberger Tr. 1/31/96 at 49, lines 3-10). [KSBE FOF440]

750. WWM conducted an islandwide assessment of its treatment plants for development of a successful reuse program. The criteria were: (1) data from the water quality monitoring reports; (2) the plant's location with respect to potential large-scale users; (3) the availability or lack of other water resources; and (4) land use within the collection basin. (Steinberger Tr. 1/31/96 at 45, lines 22-25; at 46,

lines 1-15). [KSBE FOF441]

751. The potential basins for reclamation were Kahuku, Waimanalo, Honouliuli and Wahiawa. (Steinberger Tr. 1/31/96 at 48, lines 7-9). [KSBE FOF442]

752. There also may be future opportunity to reuse Kahuku effluent for irrigation of Kahuku Golf Course. (Honke Tr. 1/30/96 at 196, lines 19-25). [KSBE FOF443]

753. Central Oahu was also considered; however, two (2) major obstacles surfaced: (1) DOH and BWS object to use of reclaimed water over potable aquifers until more information is obtained about the potential effects of reclaimed water use over potable aquifers, and (2) transportation of the reclaimed water from the Honouliuli WWTP at a lower elevation of 45 feet mean sea level to the upper elevations, which range from 600 to 800 feet, would be costly to construct, operate, and maintain. (Steinberger Tr. 1/31/96 at 48, lines 9-21). [KSBE FOF444]

754. If reuse in Central Oahu were to be considered over the potable aquifer to address DOH and BWS concerns for increases in nutrients, dissolved solids and organic carbons within the aquifer, additional treatment of the reclaimed water to an R-1 advance stand or dilution with surface water would be needed. (Steinberger Tr. 1/31/96 at 67, lines 10-25; at 68, line 1). [KSBE FOF464]

755. WWM is specifically targeting the Wahiawa and Honouliuli tributary areas for reuse opportunities. (Limtiaco Tr. 1/30/96 at 13, lines 19-21). [KSBE FOF445]

756. WWM is not currently prepared to deliver reclaimed water to the Leeward farmers. Studies on protecting potable water sources, developing schemes and strategies to assure the public health and environmental quality, and identification of a purveyor of the reclaimed water are necessary before such a step can be taken. (Limtiaco Tr. 1/30/96 at 34-35). [KSBE FOF463]

757. The Ewa caprock aquifer has been used as a source of brackish irrigation water for landscaping of golf courses and large park areas. Independent users within the aquifer are withdrawing approximately 8 MGD per day. With a greater demand being projected for the future concern of the capability of the caprock aquifer to provide nonpotable water started to grow. (Steinberger Tr. 1/31/96 at 51, lines 1-11). [KSBE FOF449]

758. The 1989 report, Groundwater Resources and Sustainable Yield Ewa Caprock Aquifer, done by Yuen and Associates for the Commission on Water Resource Management, evaluated the available data and confirmed that the salinity of the aquifer would rise and the aquifer would be unsuitable for irrigation use.

(Steinberger Tr. 1/31/96 at 51, lines 11-19; Exhibit T-127). [KSBE FOF450]

759. The caprock aquifer was selected because it is strictly utilized for nonpotable irrigation water for golf courses and landscape irrigation and **because the** reuse project is a way to freshen the aquifer and ensure its sustainability. (Limtiaco Tr. 1/30/96 at 17, lines 22-25; at 18, lines 1-7). [KSBE FOF454]

760. The reclaimed water that will be processed at the nearly completed 13 MGD secondary unit at the Honouliuli WWTP will be dedicated to the Ewa caprock project. (Steinberger Tr. 1/31/96 at 67, lines 5-7). [KSBE FOF455]

761. A 5 MGD pilot project would be implemented first to evaluate technical viability and environmental appropriateness. (Limtiaco Tr. 1/30/96 at 17, lines 18-22; Steinberger Tr. 1/31/96 at 53, lines 1-4). This increment will include groundwater monitoring to establish a water quality database, implementation of a reuse management plan and development of a fee structure. (Steinberger Tr. 1/31/96 at 53, lines 5-8). [KSBE FOF456]

762. If the pilot project is successful, the Honouliuli WWTP should have approximately 13 MGD of R-2 quality water available by the year 2001 to recharge the Ewa caprock. (Limtiaco Tr. 1/30/96 at 17, lines 12-16; Steinberger Tr. 1/31/96 at 53, lines 8-10; at 182, lines 24-25). [KSBE FOF457]

763. DOH totally supports the City's efforts to use wastewater to recharge the Ewa caprock area. (Anderson Tr. 2/1/96 at 148, lines 2-3). [KSBE FOF458]

764. The total capital cost for the percolation system is estimated to be \$16.8 million. (Steinberger Tr. 1/31/96 at 62, lines 23-24). [KSBE FOF459]

765. The capital cost of constructing Ultraviolet disinfection and effluent pumps for reclamation at the Honouliuli WWTP is \$14.5 million. (Steinberger Tr. 1/31/96 at 87, lines 19-25; at 88, lines 1-19). [KSBE FOF460]

## **7. Cost Impacts**

766. If the City were to construct a distribution system from the Honouliuli WWTP for direct delivery to the caprock users in the lower Ewa Plain, the **estimated** cost would be \$2.24 per 1,000 gallons. There would be additional costs for operation and maintenance of the distribution system. (Steinberger Tr. 1/31/96 at 65, lines 8-14). [KSBE FOF461]



767. The **estimated** cost to upgrade the 13 MGD Honouliuli R-3 water to R-1 water and distribute to the lower Ewa plain would be \$2.98 per 1,000 gallons, not including operation and maintenance cost for the distribution system. (Steinberger Tr. 1/31/96 at 65, lines 16-25; at 66, lines 1-9). [KSBE FOF462]

768. No infrastructure exists to either treat sewage to R-1 quality or deliver treated effluent from the Honouliuli Plant to the Central Oahu fields. (Honke Tr. 1/30/96 at 160, lines 18-24). [KSBE FOF465]

769. WWM has no plans for additional expansion of secondary treatment facilities at the Honouliuli WWTP. (Limtiaco Tr. 1/30/96 at 31, lines 5-7). [KSBE FOF466]

770. An additional 13 MGD secondary treatment unit would need to be constructed at the Honouliuli WWTP at an estimated cost of \$1.59 per 1,000 gallons. The secondary facility would produce R-3 water, secondary nondisinfected water. (Steinberger Tr. 1/31/96 at 68, lines 2-9). [KSBE FOF467]

771. The estimated **total** cost to upgrade this additional 13 MGD unit **from R-3** to R-1 water would be \$2.74 per 1,000 gallon. (Steinberger Tr. 1/31/96 at 68, lines 10-18). [KSBE FOF468]

772. The estimated **total** cost to provide additional treatment to the R-1 water **[of]** **by** reverse osmosis to reduce total dissolved solids and granulated activated carbon to remove total organic carbon would be \$4.77 per 1,000 gallons. (Steinberger Tr. 1/31/96 at 68, lines 19-25; at 69, lines 1-13). [KSBE FOF469]

773. In addition to the treatment a distribution system would be required to deliver the water to Central Oahu. (Steinberger Tr. 1/31/96 at 69, lines 14-16). [KSBE FOF470]

774. The estimated cost of constructing a distribution system to Waiawa would be \$1.31 per 1,000 gallons. (Steinberger Tr. 1/31/96 at 70, lines 16-21). [KSBE FOF471]

775. The estimated total cost for upgrading 13 MGD of effluent to R-1 advanced treatment and delivering it to Central Oahu would be \$6.08 per 1,000 gallons. (Steinberger Tr. 1/31/96 at 69, lines 14-25; at 70, lines 1-24). [KSBE FOF472]

776. There would be additional compliance and monitoring costs the reclaimed water user would need to pay. (Steinberger Tr. 1/31/96 at 147, lines 12-18). [KSBE FOF473]

777. The City's obligation to the community is to provide sewer services in [a] **the most** cost-effective manner as possible. (Limtiaco Tr. 1/30/96 at 33, lines 9-10). [KSBE FOF475]

778. Primary treatment at Honouliuli and Sand Island WWTPs and discharge into **the** ocean [is] **may be** an acceptable level of treatment. (Limtiaco Tr. 1/30/96 at 33, lines 15-20). [KSBE FOF476]

779. Scientists who conducted the Mamala Bay study concluded that there was no significant increase in risk to public health or environmental quality from the ongoing discharges at the Sand Island and Honouliuli WWTPs. (Anderson Tr. 2/1/96 at 196, lines 24-25; at 197, lines 1-25; at 198, lines 1-25). [KSBE FOF477]

780. The capital cost of construction of the 13 MGD secondary treatment unit at the Honouliuli WWTP is chargeable to sewer users; however, operation and maintenance expenses would be passed on to reclaimed water users. (Limtiaco Tr. 1/30/96 at 36, lines 23-25; at 37, lines 1-7). [KSBE FOF478]

781. The cost of design and construction of additional plant facilities beyond the 13 MGD facility at Honouliuli WWTP and the distribution system would be passed on to the users of the reclaimed water because they would not be considered necessary treatment costs to protect public health and the environment. (Limtiaco Tr. 1/31/96 at 34, lines 15-20; at 39, lines 1-5). [KSBE FOF479]

782. The EPA consent decree, in addition to a reuse program, requires assessment of infiltration and inflow problems on an island wide basis, pretreatment program and preventive maintenance activities and improvements to the collection system. (Limtiaco Tr. 1/30/96 at 29, lines 8-29). [KSBE FOF480]

783. Total CIP program over the next twenty (20) years is \$1.2 billion which includes the evaluation and upgrades to the collection system, the Wahiawa and Honouliuli effluent reuse projects, and construction of new sewers and treatment plants in Haleiwa, Mokuleia and North Shore. (Limtiaco Tr. 1/30/96 at 31). (Exhibit T-171 at 31). [KSBE FOF481]

784. WWM is now developing a long range financial plan to finance the investments. If sewer charges are used entirely to pay for debt service, cost of these investments will cause sewer service rates to double in the next ten (10) years. (Limtiaco Tr. 1/30/96 at 32, lines 1-12; Exhibit T-172). [KSBE FOF482]

785. Disposal of Wahiawā and Schofield Barracks effluent into Lake Wilson may have to be discontinued. Ex. A-201, p. 4-4. [WWCA FOF117]

786. Wastewater disposal options are a major factor in determining the ultimate cost to the user. Richard Bowen, November 30, 1995, p. 110, ll. 24-25; p. 111, l. 1. [WWCA FOF119]

## **H. Alternative Sources to Water from the Waiahole Ditch System**

Section H briefly discusses some of the alternative sources of water that could supplement or replace Waiahole Ditch system water.

787. Waiahole Ditch is a gravity system which does not rely on energy for delivery to the approximate 600' elevation in Central Oahu. Paty, Tr., 11/29/95, P162/L4-18; Wainee, Tr., 12/14/95, P9/L2-5. All other potential sources for irrigation water for Central Oahu would require energy for pumping to the 600' elevation level. Paty, WST, 10/30/95, P5; Paty, Tr., 11/29/95, P162/L10-17; Osgood, Tr., 12/12/95, P151/L7-23. [WIC FOF355]

788. The Campbell Estate has well permits for 35 mgd. Russell, Tr., 11/30/95, P8/L16-24. [WIC FOF358]

789. BWS advocates the use of high quality irrigation for agriculture to maintain the high quality of the potable aquifer. Usagawa, Tr., 1/25/96, P142/L21-25. [WIC FOF361]

790. BWS furnishes potable water for small agriculture needs to farmers who use less than 250,000 gallons per day at preferential quantity rates which are slightly lower than general use rates. The agricultural monthly water rate is \$1.77 per thousand gallons for the first 13,000 gallons, then \$.75 per thousand gallons thereafter. Usagawa, Tr., 1/23/96, P114/L2-13; Ex. T-155. [WIC FOF362]

791. BWS participated in construction of the Kalauao nonpotable system, which develops water from the Kalauao Streams to the Sumida watercress farm in Pearl City, and serves the Aloha Stadium, the Halawa quarry, and the areas along H-1 Freeway toward the airport. The users are paying for the system through a recovery-type water rate. Usagawa, Tr., 1/25/96, P14; Ex. T-178. [WIC FOF364]

792. The increased cost of developing alternative water sources will be borne by the entire island through increased water rates and housing costs. Usagawa, WDT, 9/18/95, P39/¶117. [WIC FOF368]

793. Del Monte is currently using pumped water from its wells 2 and 3 to irrigate the pineapple on Campbell Estate's lands for which it seeks Waiāhole water. Brian Nishida, December 12, 1995, p. 212, 15-25; p. 213, ll. 1-9. [WWCA FOF135]

794. Del Monte is making a profit on its pineapple operations without Waiāhole water. Brian Nishida, December 12, 1995, p. 214, ll. 4-10. [WWCA FOF136]

795. Royal O'ahu is applying for an on-site well, that would be the most reliable and cost effective source of irrigation water for the golf course. Howard Hamamoto, March 7, 1996, p. 168, ll. 9-21. [WWCA FOF138]

796. Pu'u Makakilo's original owners had planned to use desalinated water from caprock wells for golf course irrigation. Edward Dewey, December 21, 1995, p. 71, ll. 12-25; p. 172, ll. 1-7. [WWCA FOF143]

## **I. State Planning**

To obtain a water use permit, an applicant for an existing or proposed use is required to establish that the use is consistent with State land use plans. Section I briefly discusses the roles of the Office of State Planning (OSP) and the State Land Use Commission (LUC) in the State planning process. Testimony and evidence in the proceedings indicated that all of the water use permit applications, interim instream flow standard amendments, and reservations for Waiahole Ditch water are consistent with the Hawaii State Plan and State land use classifications.

### **1. General**

797. The legal authority of the Office of State Planning ("OSP") is found in HRS Chapter 225M. OSP is charged with assisting the Governor in the overall analysis and formulation of State policies and strategies including but not limited to land use and water use. (Pai Tr. 11/28/95 at 13, lines 19-23). [KSBE FOF58]

798. OSP provides central direction and cohesion in the allocation of resources and effectuation of State activities and programs to effectively address current or emerging issues and opportunities. (Pai Tr. 11/28/95 at 13, lines 24-25; at 14, lines 1-2). [KSBE FOF59]

### **2. State Land Use**

799. As far as OSP's role relative to land use, OSP is charged with developing and presenting the State's position on all boundary changes, petitions and proceedings before the State Land Use Commission ("LUC"). OSP specifically articulates before the LUC the State Administration's position with respect to land use policies. (Pai Tr. 11/28/95 at 14, lines 3-11). [KSBE FOF60]

800. The LUC is responsible for the classification of all of the land in the State of Hawaii. Land is classified into four (4) major land use districts[,], conservation, agriculture, urban and rural. (Mossman Tr. 11/15/95 at 103, lines 10-12). [KSBE FOF61, WIC FOF188]

801. The State or OSP is required to conduct periodic reviews of State land use district boundaries. The most recent review was conducted in 1992. (Kobayashi Tr. 11/21/95 at 105, lines 11-15). [KSBE FOF62]

802. **[Island wide] On Oahu**, 82,251 acres of land are in the Urban district, 133,681 acres are in the Agricultural District and 159,714 acres are in the Conservation District. [KSBE FOF63]

803. No land on Oahu is designated Rural. All of the urban lands are regulated by the counties. The state and the counties share the responsibility for protecting agricultural lands in Hawaii. (Mossman Tr. 11/15/95 at 103, lines 13-20). [KSBE FOF64]

### **3. State Water Use**

804. The Hawaii State Plan, specifically HRS Section 226-16, provides that planning for the State's facility systems with regard to water shall be directed toward the achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational, and other needs within resource capacities. (Pai Tr. 11/28/95 at 16, lines 16-25; at 17, lines 1-25; at 18, lines 1-25; at 19, lines 1-2). [KSBE FOF70]

805. The primary concern of the State is the maintenance and the health, safety, welfare of the people. The priority of State policy with respect to the use of water has always been domestic consumption, followed by the creation of jobs and economic development through agriculture and the preservation of the agricultural land base. (Pai Tr. 11/28/95 at 19, lines 3-8). [KSBE FOF71]

806. The Hawaii State Plan and its related functional plans provide no distinction with respect to the overall water and land use policy or economic policies between the various islands of this State. (Pai Tr. 11/28/95 at 19, lines 19-25; at 20, lines 1-25; at 21, lines 1-23). [KSBE FOF72]

807. The Hawaii State Plan, specifically HRS Section 226-4, provides that in order to guarantee, for present and future generations, those elements of choice and mobility that ensure that individuals and groups may approach their desired levels of self-reliance and self-determination, it shall be the goal of the State to achieve: 1)

a strong, viable economy, characterized by stability, diversity and growth that enables the fulfillment of the needs and expectations of Hawaii's present and future generations; 2) a desired physical environment, characterized by beauty, cleanliness, quiet stable natural systems and uniqueness that enhances the mental and physical well-being of the people; and 3) physical, social and economic well-being for individuals and families in Hawaii that nourishes a sense of community responsibility of caring of a participation in community life. (Pai Tr. 11/28/95 at 23, lines 15-25; at 24, lines 1-15). [KSBE FOF73]

808. All of the WUPAs for Waiahole Ditch water are consistent with the Hawaii State Plan. Pai, 11/28/95, P28/L8-25, P29/L1-20. [WIC FOF133]

809. The Joint Applicants' existing and proposed uses are consistent with the state land use classifications for those parcels. 10/2/95 Clarification Letter; Dole/C&C WUPA. [WIC FOF134]

810. The use of Waiahole ditch water for diversified agriculture on lands designated as priority agricultural lands is reasonable and consistent with state land use plans and policies. Nakatani, WDT, Ex. L-500, P7-8; Schwind, Tr., 12/7/95, P129; Schwind, WDT, 9/18/95, P13/L4-9. [WIC FOF135]

811. Use of relatively cheap Waiahole Ditch water is in harmony with the State plan to support development of agriculture. Pai, Tr., 11/28/95, P33/L7-11. [WIC FOF139]

#### **4. State Policy Regarding Golf Courses**

812. Golf courses in general generate more jobs on a per acre basis than diversified agriculture products. (Pai Tr. 11/29/95 at 9, lines 18-25; at 10, lines 1-6). [KSBE FOF77]

813. Based upon an OSP report dated 1992, there are roughly about thirty-eight (38) to forty (40) golf courses existing at the time in the State and these golf courses generate approximately \$140 million gross revenues and employs approximately 3,000 to 4,000 people. (Pai Tr. 11/29/95 at 29, lines 20-25; at 30, line 1). [KSBE FOF78]

814. The use of Waiahole Ditch water for golf course irrigation is reasonable and consistent with state land use plans and policies. Pai, Tr., 11/28/95, P15/L9-25, P16/L1-4. [WIC FOF136]

### **J. City and County Planning Issues**

To obtain a water use permit, an applicant for a new or proposed use is required to establish that the use is consistent with county land use plans and designations. Section J discusses the elements of the county planning process and how the water use permit applications are consistent with the county's plans and designations.

## **1. General**

815. Honolulu has an evolving history of developing a comprehensive community plan. (Clegg Tr. 12/19/95 at 38, lines 20-21). The first plan was developed in 1964. The motivating force behind this plan was a court ruling which held unconstitutional certain zoning changes that were made in the absence of a master plan. (Clegg Tr. 12/19/95 at 27, lines 15-20). The city must have a comprehensive land use plan before it can impose controls on land use through zoning ordinances or through the land use plan itself. (Clegg Tr. 12/19/95 at 38, lines 17-19). [KSBE FOF81]

816. In 1969, the city implemented the General Plan along with a program which allowed the plan to be updated and improved. (Clegg Tr. 12/19/95 at 27, lines 20-22). In 1973, the voters approved a new charter which created the Department of General Planning and the Department of Land Utilization. This charter mandated a major overhaul of the plans and planning process. (Clegg Tr. 12/19/94 at 28, lines 1-4). [KSBE FOF82]

817. In 1977 the City Council adopted major revisions to the General Plan. These were the result of several years of study and analysis as well as community meetings throughout the island. (Soon Tr. 11/14/95 at 67, lines 19-22). [KSBE FOF83]

818. Today, the city has a comprehensive community plan. This plan includes land use, the General Plan, and the Development Plans. (Clegg Tr. 12/19/95 at 38, lines 22-25). The plan also incorporates the need to provide the necessary infrastructure to support its policies, including the need for water. The City Council approved this plan and is now city policy. (Clegg Tr. 12/19/95 at 39, lines 2-3). [KSBE FOF84]

819. Initially, city planners analyzed four (4) alternative growth scenarios. (Clegg Tr. 12/19/95 at 28, lines 23-24). These scenarios were: (1) intensive development and growth only in existing urban boundaries; (2) private sector initiatives; (3) moderate expansion where new housing would be permitted on lands outside of, but adjacent to, existing urban boundaries; and (4) directed growth. Directed growth was selected as the best policy. (Clegg Tr. 12/19/95 at 29, lines 1-7). [KSBE FOF85]

820. The plan says to direct growth to Ewa first, with some growth directed to Central Oahu. Ewa was chosen based on three (3) criteria: (1) cost of housing; (2)

cost of infrastructure; and (3) use of productive agricultural land. (Clegg Tr. 12/19/95 at 29, lines 11-13). Ewa was selected over Central Oahu because Central Oahu had better agricultural lands. (Clegg Tr. 12/19/95 at 29, lines 16-17). [KSBE FOF86]

821. The result of the plan is that there has been very little new development in Windward Oahu in the last fifteen (15) years. (Clegg Tr. 12/19/95 at 32, lines 11-13). [KSBE FOF87]

822. The Ewa side, however, has seen a significant increase in urban development. Various developments include: Campbell Industrial Park; six (6) hotel sites at Ko Olina, including one that is already operational; establishment of state and county government facilities; the West Oahu campus of the University of Hawaii; and various housing projects at West Loch, Kapolei, Ewa Gentry and Ewa Marina. (Clegg Tr. 12/19/95 at 32, lines 13-22; at 33, lines 1-15). [KSBE FOF88]

823. The result of this ongoing and planned development is that there will be a substantial need for potable and nonpotable water. (Hara WDT 9/18/95 at 8, para 20; Clegg Tr. 12/19/95 at 34, lines 9-10). Water is an important infrastructure need, in addition to sewer facilities, transportation, and drainage. (Clegg Tr. 12/19/95 at 31, lines 1-2). [KSBE FOF89]

824. The City's comprehensive land use policy is expressed in its General Plan, Development Plans, Land Use Ordinance and Functional Plans. These planning functions are mandated by both the Revised Charter of the City and County of Honolulu 1973 and HRS Chapter 46, County Organization. (Soon WDT 9/18/95 at 3; Whalen WDT 9/18/95 at 6, lines 12-18). [KSBE FOF91]

825. The Planning Department is charged with the responsibility for comprehensive planning at the county level; the counterpart for the State level is the OSP. There is continual consultation between OSP and the City's Planning Department for the exchange of data as well as policy formation. (Whalen WDT 9/18/95 at 6, lines 13-25). [KSBE FOF92]

826. The purpose of preparing a general plan and development plans is to recognize and anticipate the major problems and opportunities regarding the social, economic and environmental needs and future development of the City and to establish a desired direction and pattern for future growth. (Exhibit S-1). [KSBE FOF93]

827. All of the applications for water use permits, instream flow amendments and water reservations are consistent with one or more policies of the General Plan. (Soon Tr. 11/14/95 at 71, lines 24-25). [KSBE FOF128]



## **2. Development Plans**

828. The General Plan policies and objectives are implemented in the format of Development Plans for subareas of the island of Oahu and provide for land use and public facility planning. (Ukishima WDT 9/18/95 at 10, paragraph 27). [KSBE FOF139, WIC FOF94]

829. Development Plans are relatively detailed guidelines for the physical development of the island. Together with the General Plan, Development Plans set forth the desired direction and pattern of growth and development of the City and County. They incorporate the community character and environmental qualities that are unique to each region. (Ukishima Tr. 11/14/95 at 156, lines 18-24). [KSBE FOF140]

830. The Honolulu City and County General Plan is a statement of the objectives and policies relating to land use planning adopted by the City Council by ordinance. The Honolulu City and County Development Plans are detailed land use planning documents addressing the needs and desires of the citizens of Honolulu and furthering the objectives and policies of the General Plan. The Development Plans are also adopted by the City Council by ordinance. Tr. November 14, 1995 at p. 155, l. 9 - p. 157, l. 1. [OHA FOFIII.A.3.]

## **3. City Land Use Ordinance**

831. The City's zoning regulations are contained in the Land Use Ordinance. Lands that are in the State Agricultural District are designated Agricultural on the City's Development Plan maps and are zoned either AG-1 or AG-2 by City ordinances. (Mossman Tr. 11/15/95 at 107, lines 17-19). [KSBE FOF160]

832. The purpose of agricultural districts is to maintain a strong agricultural economic base to prevent unnecessary conflicts among incompatible uses, to minimize the cost of providing public improvements and services, and to manage the rate and location of physical development consistent with the City's adopted land use policies. (Mossman Tr. 11/15/95 at 107, lines 20-25). [KSBE FOF161]

833. The Agricultural AG-1 District conserves and protects the lands which are classified as prime or unique under the Agricultural Lands of Importance to the State of Hawaii, ("ALISH"), and are mostly parcels that are larger than five (5) acres. (Mossman Tr. 11/15/95 at 108, lines 1-6). [KSBE FOF162]

834. The AG-2 district is intended to conserve and protect agricultural activities on smaller parcels of land. (Mossman Tr. 11/15/95 at 108, lines 10-11). [KSBE

FOF163]

#### **4. City Agriculture Land Use Policies**

835. The City has adopted objectives and policies for the preservation of agricultural lands for the long term and the support of a viable agricultural industry on Oahu. (Mossman Tr. 11/15/95 at 99, lines 4-15). [KSBE FOF164]

836. Support of agriculture in Central Oahu is part of the General and Development Plans. (Holmes Tr. 3/7/96 at 128, lines 10-15) [KSBE FOF165, WIC FOF96]

837. The City's land use policies for agriculture on Oahu are implemented through the Development Plans and through the zoning districts established in the Land Use Ordinance. The Development Plan Land Use Maps identify the agricultural areas. (Mossman Tr. 11/15/95 at 106, lines 16-21). [KSBE FOF166]

838. The Leeward applicants' existing and proposed agricultural operations are consistent with land use designations for these parcels of land in the City's Ewa and Central Oahu Development Plans. (Soon Tr. 11/14/95 at 72, lines 10-25; at 73, lines 1-23). [KSBE FOF174, WIC FOF112, OHA III.A.1.]

839. The parcels identified within the State of Hawaii DLNR application for water use for proposed agriculture are consistent with the agriculture land use designation in the Ewa and Central Development Plans. (Soon Tr. 11/14/95 at 72, lines 15-18). [KSBE FOF175, WIC FOF115]

840. The DOA parcels identified within their request for water reservation for proposed agriculture are consistent with the agriculture land use designations in the Ewa and Central Development Plans. (Soon Tr. 11/14/95 at 75, lines 16-18). [KSBE FOF176, WIC FOF113, 114]

841. The DHHL's request is consistent with the Koolaupoko Development Plan. (Soon Tr. 11/14/95 at 75, lines 19-20). [KSBE FOF177, WIC FOF117]

842. The request by KSBE for Phase 1 of the development of Waiawa by Gentry is consistent with the City's Development Plan land use designations for these parcels of land. A request for a Development Plan amendment has been submitted for Phase II. (Soon Tr. 11/14/95 at 75, lines 24-25; at 76, line 1). [KSBE FOF178]

843. Phase II of the Kamehameha Schools/Bishop Estate Waiawa project has not

yet been included in the Development Plan for the Waiawa area. *Id.*, ll. 24-25. [OHA FOFIII.A.2.]

844. The Navy's parcels identified in **[their] its** application are designated military on the Ewa and Central Oahu Land Use Maps. The agriculture uses on Navy land formerly used by OSCO **[is] are** consistent with the City's Development Plans. (Soon Tr. 11/14/95 at 74, lines 4-8). [KSBE FOF179]

845. Halekua's proposed agricultural park and existing Royal Oahu Resort Golf Course are consistent with their land use designations in the Central Oahu Development Plan. (Soon Tr. 11/14/95 at 74, lines 9-23). [KSBE FOF180]

846. The proposed agricultural operation of Nihonkai is consistent with the City's land use agricultural designation on the Central Oahu Development Plan for this parcel of land. (Soon Tr. 11/14/95 at 75, lines 5-8). [KSBE FOF181]

847. West Beach Estate's proposed Ko Olina Resort Development and golf courses (shown on the Ewa Development Land Use Map) are consistent with the land use designation in the City's Ewa Development Plan. (Soon Tr. 11/14/95 at 75, lines 9-11). [KSBE FOF182]

848. The use of Waiahole Ditch water for golf course irrigation is consistent with the City's Development Plans. (Ukishima Tr. 11/15/95 at 37, lines 6-14) [KSBE FOF183, WIC FOF116]

849. The requests for instream flow **amendments** are consistent with the Development Plan for Koolaupoko. (Soon Tr. 11/14/95 at 75, lines 12-15). [KSBE FOF184]

## **5. Functional Plans**

850. The City's Development Plans provide the planning guidance to agencies responsible for the development of infrastructure systems in water, transportation, wastewater management, parks and schools to accommodate and balance the islandwide needs of the people of the City and County of Honolulu. (Ukishima WDT 9/18/95 at 30, paragraph 62). [KSBE FOF203]

851. Functional Plans provide guiding principles and strategies to the various City agencies to determine needs, assign priorities, phase infrastructure and facilities development, and secure financing to meet the needs identified in the Development Plans. (Soon WDT 09/18/95 at 3, paragraph 7). [KSBE FOF204]

852. All facility plans currently in effect, including the water, transportation and wastewater plans, are based on a common set of future conditions derived from the Land Use Policies in the Development Plans. (Young Tr. 11/15/95 at 74, lines 4-9). [KSBE FOF205]

## **6. Oahu Water Management Plan**

853. The State Water Code, HRS Chapter 174, requires the formation of a Hawaii Water Plan to address comprehensive water resource planning. One of the parts of the Hawaii Water Plan is the water use and development plans adopted by each county. The water use and development plan for Oahu is called the Oahu Water Management Plan ("OWMP"). (Hara Tr. 11/21/95 at 59, lines 6-10). [KSBE FOF206]

854. The OWMP is a detailed water supply functional plan. It analyzes water resource development in terms of meeting projected water demands of municipal and other large water users. It also develops long-range strategies for the improvement and expansion of major government facilities and service systems. (Sato Tr. 1/9/96 at 18, lines 14-20) [KSBE FOF207]

855. The projections of these plans serve as the basis for structuring and budgeting the BWS's capital improvement and long-range water system planning process. This process involves preparing and coordinating a six-year CIP and long-range water resource Development Plan. (Sato Tr. 1/9/96 at 18, lines 21-25) [KSBE FOF208]

856. The City and County of Honolulu Planning Department prepares the water use and development plan for the City and County of Honolulu. The preparation of the OWMP is done with the assistance of BWS, Department of Wastewater Management ("WWM"), and staff of the Commission on Water Resource Management ("Commission"). (Soon Tr. 11/14/95 at 104, lines 8-11; Hara Tr. 11/21/95 at 59, lines 20-25). [KSBE FOF209, WIC FOF109]

857. The OWMP was adopted by the City Council and the Commission in 1990. (Hara Tr. 11/21/95 at 77, lines 1-2; at 78, lines 6-12). [KSBE FOF210]

858. There are two (2) parts which make up the OWMP. The first part is the plan itself and the second is the supporting Technical Reference Document ("TRD"). The TRD for the OWMP is currently being revised to update supporting data, conclusions and analysis. (Exhibit 9) [KSBE FOF211]

859. The OWMP TRD describes in detail the nature and extent of Oahu's water supply, water usage and water developments. The documents divide primarily into

three (3) parts: (1) existing water use and development; (2) future land uses and related water needs; and (3) regional plans for water development. (Exhibit 9 at 2). [KSBE FOF212]

860. The OWMP recognizes that water is a limited resource and the development and use of water must be carefully planned to meet the future needs of Oahu residents. The OWMP consists of policies and strategies which guide the activities of the City and County of Honolulu in the areas of planning, management, water development and use. (Hara Tr. 11/21/95 at 59, lines 11-16). [KSBE FOF213]

861. OWMP objectives are to ensure the optimum utilization of the existing water supply in order to minimize the need for development of additional potable groundwater sources, preservation of the aquifers for the benefit of future generations by proper management of groundwater sources, the timely development of additional potable groundwater and alternative sources to provide for additional consumer demand, and growth in consumer demand compatible with available water supply. (Hara WDT 9/18/95 at 4, paragraph 10). [KSBE FOF214]

862. The strategy for water management set forth in the OWMP is to continue to develop available groundwater sources, but to preserve as much of the groundwater resource as possible by more efficient use of the existing water supply and ongoing water conservation program, and continued development of alternative water sources wherever feasible to ensure an adequate supply of water for planned uses on Oahu. (Hara Tr. 11/21/95 at 62, lines 23-25; at 63, lines 1-6). [KSBE FOF215]

863. The OWMP assumed that Waiahole water would be available for agriculture, and because of its availability, increases in municipal demand would be largely offset by reductions in plantation water requirements. (Hara WDT 9/18/95 at 8, paragraph 9). [KSBE FOF216, WIC FOF110]

864. The OWMP identified excess sustainable yields which remain available to be developed on the North Shore and windward Oahu subject to instream flow standards. (Hara Tr. 11/21/95 at 91, lines 22-25; at 92, lines 1-5). [KSBE FOF217]

865. Implementation of alternative sources such as desalination of brackish water and reuse of wastewater effluent would depend on their economic feasibility and compliance with environmental regulations of DOH. (Hara Tr. 11/21/95 at 63, lines 6-11). [KSBE FOF218]

866. The OWMP also recommended the pursuit of nonpotable water where feasible for irrigation of agriculture crops, parks, golf courses and certain industrial uses. (Soon Tr. 11/14/95 at 77, lines 9-11; Hara Tr. 11/21/95 at 70, lines 16-20; at 73, lines 19-22). [KSBE FOF219]

867. Planning of future water resources and distribution systems for Oahu is conducted so as to meet the requirements for water necessitated by the growth and land use plans and policies of the City. (Hara WDT 9/18/95 at 2, para 3) [KSBE FOF220]

868. BWS uses the population projections calculated by the State and regional per capita water demand factors to estimate the demand for water and to formulate plans for water source development, transmission and storage facilities in concurrence with the phasing schedules in the City's Development Plans. (Usagawa Tr. 1/23/96 at 83, lines 22-25; at 84, lines 1-2). [KSBE FOF221]

869. The City's plans are not dependent upon water available in the same location as the water need. In order to accommodate urban growth in accordance with the State and County land use plans, water is transported from areas of supply to areas of demand. (Hara Tr. 11/21/96 at 60, lines 20-23). [KSBE FOF222]

## **K. Honolulu BWS Planning Issues**

### **1. Water Conservation**

870. Unaccounted for water can result from underground leaks, meter inaccuracies, illegal connections, reservoir evaporation and seepage, and unmetered uses such as fire fighting and flushing of water mains. Tanaka, Tr., 12/21/95, P173/L4-7. [WIC FOF424, ~~KSBE FOF296~~]

871. BWS' unaccounted for water rate of less than 10 percent compares favorably with metered systems nationwide which range from 10 to 20 percent of the total water entering supply line systems. Tanaka, Tr., 12/21/95, P172/L25-P173/L7. [WIC FOF425]

872. Wherever possible, BWS encourages the use of nonpotable water for agriculture uses to extend fresh water supplies. (Tanaka Tr. 12/21/95 at 166, lines 17-20) [KSBE FOF298]

873. BWS has conducted four studies for the purpose of identifying nonpotable water sources, usage sites and the facilities necessary to make the water available. (Tanaka Tr. 12/21/95 at 167, lines 1-4) [KSBE FOF299]

874. In an effort to promote the use of nonpotable water for irrigation, the BWS adopted Resolution No. 598 which requires the use of nonpotable water for irrigation of large landscaped areas if a suitable source of nonpotable water is readily available. (Tanaka Tr. 12/21/95 at 166, lines 21-25) [KSBE FOF300]

## 2. Water Source Development

875. Prior to OSCO's close, the BWS options to provide additional water supply for projected growth, in particular for the secondary urban center were to develop nonpotable irrigation sources to exchange with OSCO's potable sources; seek reallocation of plantation permitted use no longer needed in agriculture; develop more water in the Windward and North sectors where excess available sustainable yield exists and to complete the desalination feasibility and site evaluation study and program design and construction in the BWS CIP. (Usagawa Tr. 01/23/96 at 93, lines 3-25; at 94, lines 1-2; Exhibit T-165) [KSBE FOF311]

876. The water source development plans after OSCO's close maintain the previous plans with the exception, that the preferred option is to seek reallocation of Pearl Harbor aquifer **sector** groundwater allocation not in agriculture through the CWRM because it is the most cost effective alternative. (Usagawa WDT 09/18/95 at 13, paragraph 38; Tr. 01/23/96 at 95, lines 22-25; at 96, lines 1-2; Exhibit T-166) [KSBE FOF312]

877. For the past 25 years, BWS has been implementing the Windward water development plan and has invested substantial capital to install major infrastructure in windward Oahu to develop excess water to export to East Honolulu, so that BWS could redirect Pearl Harbor water presently going into town to the new growth in Ewa and Central Oahu. (Usagawa WDT 9/18/95 at 26, paragraph 76; Tr. 1/23/96 at 94 lines 6-25). [KSBE FOF313]

878. The Board of Water Supply's long-range planning process with respect to diversion of water from streams is straightforward. According to the head of its Long-Range Planning Section, who is responsible for long range water resource plans, the process of deciding which streams to divert next, and when to divert them, is essentially cost-driven. When it is "necessary" and cheap enough, they do it. And the cost analysis used does not include any values assigned to "environmental, cultural, and religious values that surround stream restoration." Testimony of Barry Usagawa, TR. January 25, 1996, p. 125, lines 8-25; p. 126, p. 127, lines 1-5. [HTF FOF24]

879. The Koolau aquifer (**which includes the Waipahu-Waiawa and Waimalu aquifer systems**) is the largest and most important aquifer in the Pearl Harbor **[Ground Water Management Area] Sector**, furnishing more than half of the potable water used on Oahu. (Lao Tr. 1/9/96 at 61, lines 14-17). [KSBE FOF315]

880. The Pearl Harbor aquifer **sector** supplies water from Waianae to Hawaii Kai. Pearl Harbor provides approximately forty-three (43) MGD to Honolulu, and about 4 MGD to the Waianae area. **The** Koolauloa **aquifer system** provides 6 MGD to **the**

Koolaupoko **aquifer system**. (Usagawa Tr. 1/23/96 at 90, lines 11-15). [KSBE FOF316]

881. BWS has twelve (12) groundwater pumping stations in the Waipahu-Waiawa **[sector] aquifer system** of the Pearl Harbor aquifer **sector**. The number of wells at each station can vary from two to six wells. (Kawata Tr. 1/11/96 at 169, lines 1-9; Exhibit T-75). [KSBE FOF317]

### **3. Water Quality**

882. BWS monitors wells for salt water intrusion and overall basal water quality. Water samples are routinely collected and tested for chlorides which is one of the best indicators of salt water intrusion. (Kawata Tr. 1/11/96 at 169, lines 22-25). [KSBE FOF318]

883. All of the well waters contain many naturally occurring minerals such as chlorides, calcium and magnesium. The combined amount of these minerals in the water is called total dissolved solids or TDS. (Kawata Tr. 1/11/96 at 169, lines 12-16). [KSBE FOF319]

884. Many groundwater wells used by the plantations for agriculture irrigation contain significant amount of chlorides compared to BWS wells. Some wells contain as much as 400 ppm of chloride. (Kawata WDT 9/18/95 at 8, paragraph 24; Exhibits T-22, T-23 and T-24). [KSBE FOF320]

885. Waiahole Ditch water is a low mineral content source of water which has chlorides ranging from 12 to 14 ppm and TDS ranging from 95 to 105 ppm. (Kawata WDT 9/18/95 at 8; Exhibits T-20 and 21). [KSBE FOF321]

886. Water passing through the root zone may contain several times the salt of the applied water. The additional salt is derived from fertilizer, dissolving of soil particles, and concentration of salts in the soil by evaporation at the capillary fringe. (Lao Tr. 1/9/96 at 74, lines 23-25; at 75, lines 1-4). [KSBE FOF323]

887. As the plantations use groundwater for irrigation, the applied water and the minerals it contains percolate to the groundwater table. Repeated use creates a mineral loading increasing the salinity of the groundwater aquifer. Reducing plantation groundwater use reduces net aquifer mineral loading, thereby reducing the salinity of wells pumping from that aquifer. (Kawata Tr. 1/11/96 at 174, lines 6-12). [KSBE FOF324]

888. Used over the Koolau Aquifer, Waiahole water minimizes the input of salts



from irrigation water applied over the aquifer. The Waiahole Ditch water freshens rather than salts the aquifer by providing **[a large] an** influx of high quality water that further dilutes the concentration of minerals in the aquifer, freshening the basin, lowering well water chloride levels. (Kawata Tr. 1/11/96 at 174, lines 2-5). [KSBE FOF325]

889. Rising well salinity can make the water taste unpleasing, generate customer complaints, accelerate corrosion **[to] of** plumbing and decrease the reliability of the well to produce sustainable quantities of water over time. (Kawata Tr. 1/11/96 at 175, lines 15-19). [KSBE FOF328]

890. Studies have shown improvement in groundwater quality after removal of brackish irrigation water. United States Geological **[Service] Survey** (USGS) conducted a study to determine the probable cause of an increase in salinity of the water at the Navy's Waiawa shaft and found that the quality of irrigation water applied over the potable aquifer can affect nearby down gradient sources. (Meyer Tr. 2/15/96 at 8, lines 22-25; Exhibit F-4). [KSBE FOF329]

891. Increase in salinity of the Waiawa shaft water was the result of application of high chloride irrigation waters which infiltrated into the groundwater system and the eventual movement of that water into the shaft. (Meyer Tr. 2/15/96 at 9, lines 7-20). [KSBE FOF330]

892. When fields above Waiawa shaft were no longer irrigated with high chloride irrigation water, chloride concentrations in Waiawa shaft dropped significantly to about 60 ppm, its present quality. (Meyer Tr. 2/15/96 at 10, lines 17-20). [KSBE FOF331]

893. Use of high chloride pumped water for golf course irrigation or farming above Waiawa Valley could impact Waiawa shaft water which is very pure. (Meyer Tr. 2/15/96 at 17, lines 1-9). [KSBE FOF332]

894. Applying irrigation water of 300 ppm chloride to land above the Waiawa shaft would increase the chloride levels in Waiawa shaft water from its present 60 ppm. (Meyer Tr. 2/15/96 at 38, lines 14-25). [KSBE FOF333]

895. The chloride concentration of **[the] Waiawa** shaft water would remain low if Waiahole Ditch water is used to irrigate lands above Waiawa shaft. (Meyer Tr. 2/15/96 at 42, lines 19-24). [KSBE FOF334]

896. Similar circumstances occurred at the Barbers Point Shaft. USGS conducted a study to determine whether an increase in chloride concentration of the pumped

water from Barbers Point Shaft from 1983 to 1985 was the result of an upconing of the underlying transition zone or from irrigation return water that has become saltier as a result of changes in rainfall, land use, and irrigation practices. (Exhibit F-3 at 5). [KSBE FOF335]

897. The increase of salinity in the [shaft] **Barbers Point Shaft** water was a result of application of high chloride irrigation water which infiltrated into the groundwater system and movement of that water into the shaft. (Meyer Tr. 02/15/96 at 9, lines 7-20). [KSBE FOF336]

898. Reduced application of high chloride concentration water above the [shaft] **Barbers Point Shaft** will decrease the chloride concentration in the shaft. (Meyer Tr. 02/15/96 at 10, lines 1-4). [KSBE FOF337]

899. Barbers Point shaft can produce water with lower chloride concentrations if the aquifer is recharged by fresher water or if a source of fresher water is blended with the Barbers Point shaft pumped water. (Exhibit F-3 at 2; Meyer Tr. 2/15/96 at 68, lines 21-25). [KSBE FOF338]

900. Without Waiahole Ditch water, the chloride concentrations of Barbers Point shaft would increase by 7 mg/l from 250 mg/l to 257 mg/l. This predicted increase assumes that return irrigation from Waiahole Ditch water achieves total mixing in the aquifer. (Meyer Tr. 02/15/96 at 15, lines 1-14). [KSBE FOF339]

901. With less than total mixing of Waiahole Ditch water, Waiahole Ditch water would have a more significant impact on lowering the chloride levels. (Meyer Tr. 02/15/96 at 15, lines 17-24; at 39, lines 8-11). [KSBE FOF340]

902. Assuming that irrigation uses pumped water with high chloride concentrations, Waiahole Ditch water would have a freshening effect on wells close to the fields where Waiahole Ditch water is applied. (Meyer Tr. 02/15/96 at 39, lines 12-19). [KSBE FOF341]

903. Salinity levels in those wells would increase if Waiahole Ditch water was not used for irrigation purposes, because the Waiahole Ditch water is no longer mixing with the groundwater in the immediate area of the well. (Meyer Tr. 02/15/96 at 39, lines 21-25; at 40, lines 1-2). [KSBE FOF342]

#### **4. Impact On BWS Wells**

904. The use of the Waiahole water upgradient of BWS existing wells freshens those waters. (Kawata Tr. 1/23/96 at 9, lines 16-18). [KSBE FOF343]

905. The dilution effect that Waiahole water has would result from any low chloride source that originates from outside the aquifer. (Kawata Tr. 1/23/96 at 48, lines 7-8). [KSBE FOF345]

906. Use of high chloride pumped groundwater or reclaimed wastewater instead of Waiahole water **[would] could** increase the salinity levels of the BWS' wells. (Kawata Tr. 1/23/96 at 9, lines 22-25; at 10, line 1-3). [KSBE FOF346]

907. In the event these wells become saline and must be operated at reduced capacity, costly alternatives will be needed to create additional water to make up the loss. (Kawata WDT 9/18/95 at 10, paragraph 29). [KSBE FOF347]

908. The 250 ppm isochlor, the top of the mixed zone, is within 35 feet of the bottom of Waipio Heights Wells and Waipio Heights Wells I. These wells would be **[lost] adversely affected** with the expansion of the mixed zone. (Lao Tr. 01/09/96 at 74, lines 1-5) [KSBE FOF352]

909. Backfilling of the wells, installing smaller pumps or abandonment of the wells and replacement with new wells would be necessary as the salt water moves up and endangers those wells. (Lao Tr. 01/09/96 at 74, lines 7-17; Mink Tr. 4/17/96 at 135). [KSBE FOF353]

910. As for Kunia I, Hoaeae, Waipahu II, and Waipahu I **Wells** the impact of an expansion in the mixed zone would be a reduction of pumpage to maintain water quality; or a reduction of pumpage and sealing of the bottom of the well; or a total abandonment and construction of new wells. (Lao Tr. 1/9/96 at 74, lines 7-13). [KSBE FOF354]

911. Construction of new wells is very costly and extremely difficult because rapid urbanization has eliminated the possibility of locating the new wells in those developments. Relocated wells will incur higher energy cost to lift water from greater depths. (Lao Tr. 1/9/96 at 74, lines 12-17). [KSBE FOF355]

## **5. Cost Impacts**

912. If Pearl Harbor groundwater is used for the proposed agricultural activity in Central Oahu, BWS must advance plans for additional potable water sources. (Usagawa Tr. 1/25/96 at 40-45). [KSBE FOF357, WIC FOF127]

913. The **estimated** cost to develop these additional sources of potable water is about \$7.00 per gallon, not including transmission and storage costs. (Usagawa Tr. 1/25/96 at 13, lines 13-19). [KSBE FOF358, WIC FOF128]

914. The cost of developing large capacity sources is about one-half the cost of developing small capacity regional sources with transmission mains. **[The more] More** regional sources and alternative sources that must be developed relative to the lower cost Pearl Harbor sources will substantially increase the cost to the BWS customer. (Usagawa Tr. 1/23/96 at 96, lines 4-14). [KSBE FOF359, WIC FOF129]

**6. Relationship Between Waiahole Water and Leeward Potable Water Supply**

915. BWS's projection that O'ahu's water demand will increase by 56.5 mgd over the next 25 years (by 2020) is the basis of all of BWS's cost projections. Barry Usagawa, written direct, Figure 11. [WWCA FOF229]

916. Lowering by 10 mgd BWS's 56.5 mgd projection of O'ahu's water demand by 2020 eliminates the need for desalination, at a projected cost of \$280 million, during that time period. Barry Usagawa, January 25, 1996, p. 112, ll. 7-11. [WWCA FOF231]

917. Recharge from reclaimed water or Leeward surface water used for irrigation over the Pearl Harbor aquifer would replace, gallon for gallon, recharge previously obtained from an equal amount of Waiāhole water. William Meyer, February 15, 1996, p. 43, ll. 6-19. [WWCA FOF236]

918. The water development cost, if any, of stream restoration would be the cost of accelerating development that will occur in any event. Barry Usagawa, January 25, 1996, p. 41, ll. 7-12. [WWCA FOF239]

919. Assuming an average flow of 32.3 mgd from the Ditch, Waiāhole water contributes a maximum of only 4% of the total recharge to the Pearl Harbor aquifer. William Meyer, February 15, 1996, p. 14, ll. 12-18; p. 16, ll. 10-11; p. 30, ll. 21-25. [WWCA FOF240]

920. The qualitative impact of losing recharge from the Waiāhole Ditch on the chloride levels in wells in the Pearl Harbor aquifer as well as at the Barbers Point Shaft would be "insignificant," "minimal," and "probably not measurable." William Meyer, February 15, 1996, p. 16, ll. 12-18; p. 21, ll. 5-15; p. 35, ll. 11-15. [WWCA FOF241]

921. If the OSCO pumpage that had been applied over the caprock was instead applied over the Pearl Harbor aquifer, and all Waiāhole water was restored to the streams, the aquifer would see a gain. William Meyer, February 15, 1996, p. 65, ll. 23-25; p. 66, ll. 1-13. [WWCA FOF244]

922. In 1986 only about 10 mgd of the OSCO pumpage was being applied over the [Koolau] **Waipahu-Waiawa** aquifer. John Mink, April 17, 1996, p. 116, ll. 12-13. [WWCA FOF247]

923. The rate of recharge to be expected from diversified farming is likely to be significantly lower than the rate under drip irrigation of sugar, and as low as 20 to 25 percent, because small farmers can be expected to be more conservative in their water use and refine their irrigation methods. John Mink, April 17, 1996, p. 138, ll. 7-13. [WWCA FOF248]

## **L. Diversified Agriculture**

Section L discusses the agricultural water demand, the potential to affect neighbor island diversified agriculture, and the Farm Delivery Agreement. There was no definitive testimony regarding the water requirements for diversified agriculture. Testimony indicated that there is a range of water demand which is dependent on many variables. A comfortable estimate was suggested at about 3,500 gad for diversified agriculture. Some of the lease documents have a termination clause which allows the lessee to terminate the lease if they do not get at least 75 percent of 2,500 gad (1,875 gad) at any time. Kunia diversified agriculture has the potential of adversely affecting neighbor island diversified agriculture. However, there is also room to expand production to replace imports (from out-of-State) for the local market.

### **1. Agricultural Water Demand**

924. Sou produces a variety of crops which require a diverse cultivating process, each with a different range of water needs and each requiring a different delivery system. For example, Sou's pump cost is 7.5 to 8 cents per thousand gallons. His water demand is a minimum flow average of 1,800 gallons **per acre** per day to a maximum **flow average** of [54,000] **5,400** gallons **per acre** per day. Therefore, a comfortable amount for their plan would be 3,500 gallons per acre per day. (Sou Tr. 12/13/95 at 36, lines 1-4, 11-14, 21-25). [KSBE FOF642]

925. Jefts' Campbell lease [also] specifies that average water usage is about 2,500 gallons per day per acre of arable land, and that if at least seventy-five percent (75%) of the 2,500 gallons, or 1,875 gallons, per acre per day is not made available to **the** lessee by July 1, 1996, or any time, then **the** lessee can terminate the lease. While this is not necessarily an indication of Jefts' water needs since it is probably the least amount he could survive with, it was settled for as a compromise during negotiations. Just as Jefts cannot guarantee that he could survive paying more than 47 cents per thousand gallons of water, he also cannot guarantee that he would survive at 1,875 gallons per acre per day. Although Campbell has leases with other tenants, like Del

Monte, in which they reserve the right to subsidize its tenants's water costs to avoid triggering their right to terminate if water costs get too high, Jefts has no reason to believe they would do the same for him since he is a completely different party. (Jefts Tr. 2/27/96 at 52, lines 20-25; at 53, lines 1-25; at 54, lines 1-25; at 55, lines 1-25; at 56, lines 1-6). [KSBE FOF680]

926. When questioned whether he could survive at 1,875 (75% of 2,500 gad) gallons per acre per day, Jefts stated that he did not know if he could survive on that, but he had to "pick a number somewhere" and did the best he could. (Jefts Tr. 2/27/96 at 52, lines 20-25; at 53, lines 1-25; at 54, lines 1-25; at 55, lines 1-25; at 56, lines 1-2). [CWRM FOF22]

927. The total average daily use of Waiāhole Ditch water by all the Leeward parties from August 1995 through April 1996 ranged from 3.740 mgd (January 1996) to 7.331 mgd (May 1996). Exs. A-5 and A-6 of Waiāhole Irrigation Company, Ltd.'s Response to Order Number 31 filed May 17, 1996; Waiāhole Irrigation Company, Ltd.'s report on water usage for May 1996; Waiāhole Irrigation Company, Ltd.'s report on water usage for June 1996. [WWCA FOF35]

928. The average daily use of Waiāhole Ditch water by all the Leeward parties in the nine-month period from August 1995 to April 1996 was less than 5.5 mgd. Exs. A-5 and A-6 of Waiāhole Irrigation Company's Response to Order Number 31 filed May 17, 1996; Waiāhole Irrigation Company's report on water usage for May 1996; Waiāhole Irrigation Company's report on water usage for June 1996. [WWCA FOF36]

929. Even if water were available, full agricultural production would not occur in Kunia for **[at least several] perhaps three** years. Larry Jefts, December 12, 1995, p. 62, ll. 1-8; Paul Matsuo, February 8, 1996, p. 174, ll. 19-22; p. 175, ll. 5-12. [WWCA FOF37]

## **2. Displacement of Diversified Agriculture on Neighbor Islands**

930. Kunia farmers will have the potential to displace farmers on the neighbor islands because their proximity to the markets eliminates the need for inter-island shipping. *Id.* at p. 106, ll. 3-10. [OHA FOI.A.9.]

931. Although the additional production in the Leeward area could displace neighbor island farmers, there is room to expand production to replace the imports for the local market. Yokoyama Tr. 02/13/96 at 88, lines 5-14. [KSBE FOF1177]

## **3. Farm Delivery Agreement**

932. The May 16, 1996 letter agreement among WIC and various farmers (the "Farm Delivery Agreement") sets a 35 cents per thousand gallons water delivery rate, adjusted annually after a time by the Producer Price Index during its sixteen year term. Ex. A-9. [WIC FOF158]

933. The Farm Delivery Agreement is subject to, among other things, formation of a cooperative ("Co-op") to facilitate the delivery of water from the Waiahole Ditch among its members, wherever located on the lands in Central Oahu identified in Exhibit A to that document. Ex. A-9. [WIC FOF159]

934. The lands identified by the Farm Delivery Agreement for use of the Waiahole Ditch water in Central Oahu includes all of the Campbell Estate, Robinson Estate and Nihonkai lands, as well as part of the Dole/C&C lands, identified in the Joint WUPA (the "Co-op Lands"). Ex. A-9. [WIC FOF160]

935. The Farm Delivery Agreement is subject to Castle & Cooke agreeing to, among other things, becoming a member of the Co-op. Ex. A-9. [WIC FOF161]

936. The Farm Delivery Agreement is subject to the Commission allowing the Co-op to use the Waiahole Ditch water allocated to the landowners on all of the Co-op Lands (and any Castle & Cooke lands identified in its WUPA) for agricultural and not golf course purposes without being restricted to using a maximum amount of water on any acre originally included in the WUPA. Ex. A-9. [WIC FOF162]

937. The Farm Delivery Agreement requires WIC to make available to the Co-op for use on the Co-op Lands (prior to addition of any Castle & Cooke lands) at least 14.0 mgd from the Waiahole Ditch. Ex. A-9. [WIC FOF163]

938. The delivery of water to the Co-op under the Farm Delivery Agreement is conditioned upon, among other things, the Co-op coordinating peak water demands to levelize water usage and to keep the twelve-month moving average use of water within the Commission's allocation. Ex. A-9. [WIC FOF164]

#### **M. Native Hawaiian Traditional and Customary Practices**

The Commission heard testimony that traditional and customary gathering practices in Waiahole Stream had continued until the 1960's. There was no conclusive testimony that individuals were unable to exercise traditional and customary rights, that they were denied access, or their rights were abridged. The Commission concludes that native Hawaiian traditional and customary practices, Hawaiian gathering rights, and Hawaiian cultural and historical values are not being denied. They may continue, will be protected, and, in fact, will be enhanced to the extent that

higher interim instream base flows and supplemental flows affect traditional and customary practices.

A more comprehensive discussion of native Hawaiian traditional and customary practices and its applicability to the Water Code and these proceedings is presented in the Commission's Conclusions of Law, Section E, pages 22 to 25.

## **1. Traditional Land Tenure System**

939. Native Hawaiians, prior to the Great Mahele, had a sophisticated system of land organization and management. (Ching Tr. 12/20/95 at 15, lines 17-19). The islands were divided into major land districts called *moku* which were often subdivided into *okana*, *ilikapono*, and *ahupua'a* although not every *moku* had *okana* and/or an *ilikapono*. (Ching Tr. 12/20/95 at 15, lines 19-22). An *okana* was a major subdistrict of a *moku* and may consist of three (3) or more *ahupua'a*. (Ching Tr. 12/20/95 at 15, lines 22-24). *Ilikapono* were special use area land divisions which sometimes straddled *ahupua'a* and even *okana* and *moku* division boundaries. (Ching Tr. 12/20/95 at 15, lines 24-25, at 16, line 1). [KSBE FOF486]

940. All islands and land divisions within an island had land managers. (Ching Tr. 12/20/95 at 16, lines 2-3). Generally, *ahupua'a* were under the control, for administrative purposes, of the *okana* administrator or the *ali'i okana*; or when there was no *okana*, the *ahupua'a* was under the control of the *moku* administrator or the *ali'i ai moku*. (Ching Tr. 12/20/95 at 16, lines 3-7). The *ali'i ai moku*, in turn, was under the administrative control of the *ali'i nui* and his *aha ula*, whom the manager of the *ili kupono* reported directly to in addition to the *ali'i nui*. (Ching Tr. 12/20/95 at 16, lines 7-11). [KSBE FOF487]

941. The *ahupua'a* were self sufficient economic units, which were under the control of the *ahupua'a* land manager, the *konohiki*, and sometimes for administrative purposes, an *ali'i ai ahupua'a*. (Ching Tr. 12/20/95 at 16, lines 12-16). [KSBE FOF488]

942. Probably the most important factor in determining the size of the *ahupua'a* was the water resource. Where the water resources were relatively scarce, the *ahupua'a* was large. Where the water resources were plentiful, the *ahupua'a* was relatively small. Water was the single most important factor in land use in ancient Hawai'i. **McGregor** Tr. February 22, 1996 at p. 15, l. 22 - p. 16, l. 6. [OHA FOFIV.D.1.]

943. The *ahupua'a* land manager or *konohiki* was by training the expert of the land on which he lived and oversaw. (Ching Tr. 12/20/95 at 16, lines 17-18). The



*konohiki* used his knowledge of [the] nature including the weather, the ocean and the land, to formulate his short-range and long-range strategic plans for the *ahupua'a* which were calculated to make the best use of the total resources, both land and ocean at his disposal. (Ching Tr. 12/20/95 at 16, lines 22-25). [KSBE FOF489]

944. It was the responsibility of the chiefs of the *okana*, *moku*, and *aha ula* to see the big picture and impose the proper conservation *kapu* over these lands. (Ching Tr. 12/20/95 at 17, lines 3-5). This ensured the most positive results possible over both short-term and long-term management goals over the land. (Ching Tr. 12/20/95 at 17, lines 5-7). [KSBE FOF490]

945. The *ali'i nui* enjoyed absolutely no ownership of the land in that the *ali'i nui* was the steward of the land for the ancestors. (Ching Tr. 12/20/95 at 20, lines 9-12). This stewardship entailed a land management which involved mutual interdependence among the entire range of hierarchy of the people. (Ching Tr. 12/20/95 at 20, lines 12-14). It is this cultural balance, with the introduction of the concepts of private ownership of land, that was disrupted by the *Mahele*. (Ching Tr. 12/20/95 at 20, lines 14-25). [KSBE FOF491]

946. As the population of the Hawaiian people grew, the land was divided into *ahupua'a* and *moku* districts. (Kameeleihiwa Tr. 4/3/96 at 10, lines 8-13). The *ahupua'a* is a unit of land from the mountain to the sea, which generally follows ridgelines. On the island of Oahu, there are ninety (90) or so *ahupua'a*. These *ahupua'a* are grouped into six (6) large districts called *moku* districts. The districts on Oahu are Kona, Ewa, Waianae, Waialua, Koolauloa, and Koolaupoko. (Kameeleihiwa Tr. 4/3/96 at 10, lines 14-19). [KSBE FOF492]

947. Chiefs decided to make those boundaries in order to take care of the resources and to use such resources more efficiently. It also allowed the chiefs to educate the people about what resources ought to be used by what people and to alleviate any cause for warfare, for complaints, or any kind of dispute between different people. (Kameeleihiwa Tr. 4/3/96 at 10, lines 20-25). [KSBE FOF493]

948. As such, each *ahupua'a* was supposed to be a discrete area within which the people would achieve self sufficiency starting from the mountain resources which they would need for their housing, for the canoes, down to the lowlands where they would plant taro and down to the reefs where they would build fishponds. (Kameeleihiwa Tr. 4/3/96 at 11, lines 1-8). [KSBE FOF494]

949. The *ali'is*, as trustees of the land, had a social obligation to use that land so that it was productive for all the people within the area that they controlled. In general, the obligations that the *ali'i* had, and the *konohiki* under them, included an extensive amount of control over the land and that their continued utilization of this

land was principally related to their success in making sure that the land was applied or used well for all the people within that area. (McGregor Tr. 2/22/96 at 107, lines 18-25; at 108, lines 1-3; at 109, lines 14-20). [KSBE FOF495]

950. **[As] Lilikala Kameeleihiwa testified that as** a commoner Hawaiian, there is a duty to the chiefs and the gods to care for them and to *malama* them and that there is a sense to preserve, to care, and to perpetuate them. (Kameeleihiwa Tr. 4/3/96 at 9, lines 13-19). In return, the gods and the chiefs will feed the Hawaiian people and protect them. (Kameeleihiwa Tr. 4/3/96 at 9, lines 20-25). [KSBE FOF496]

951. Generally, the *konohiki* of a particular *ahupua'a* had responsibility as a steward of that *ahupua'a* to take care of the natural resources in order to avoid depletion, having the right to impose a *kapu* to maintain the natural resources and regrowth. (McGregor Tr. 2/22/96 at 70, lines 5-22). [KSBE FOF497]

952. On the contrary, any Hawaiian who wanted to move into Waiahole would be able to, especially given the land history in Waiahole where there **[has] have** been so many dislocations since the time of *Mahele*. However, if everyone who had the right wanted to live in a particular watershed, that would deplete the natural resources of the area which is what the traditional Hawaiian concept of governance attempted to prevent. (McGregor Tr. 4/16/96 at 60, lines 1-23). [KSBE FOF498]

## **2. Great Mahele (Kuleana Act)**

953. **[During] Marion Kelly testified that during** the period of time in which there was a change over from Hawaiian use rights in the land to private property rights, the Hawaiian people were forced off their lands and were placed into labor at plantations. Most of the native Hawaiians did not receive their lands pursuant to the Kuleana Act. (Kelly Tr. 4/4/96 at 119, lines 5-19). [KSBE FOF499]

954. **[As] Marion Kelly testified that as** a result of the Kuleana Act, seventy-five percent (75%) of the adult males not getting land were unable to continue their culture or to continue to grow taro to feed themselves. This seventy-five percent (75%) figure only refers to Kuleana Grants and does not cover any other conveyances by the government in addition to the Kuleana Grants (Kelly Tr. 4/4/96 at 130, lines 16-22). As such, they were forced to go into the cities. (Kelly Tr. 4/4/96 at 119, lines 20-25, at 120, line 1). [KSBE FOF500]

955. **[Even] Marion Kelly testified that even** those who received lands pursuant to the Kuleana Act were taxed on their property. As such, the native Hawaiians often had to leave their lands and go into the city to get money to pay for their taxes.

(Kelly Tr. 4/4/96 at 120, lines 2-8). When these people returned to their properties they often found their homes taken away and replaced with sugarcane or ranches. (Kelly Tr. 4/4/96 at 120, lines 9-19). [KSBE FOF501]

956. WWCA attempted to obtain the total amount of acreage and the total number of *lo'i* cultivated at the time of the Mahele. However, the total number of *lo'i* were compiled from the applications for LCA (**Land Commission Awards**) awards. Therefore, the amount of acreage does not indicate how much *lo'i* was actually cultivated. In fact, there is no relationship between the number of *lo'i* and the acreage awarded. (Shimizu Tr. 4/3/96 at 182, lines 15-24; at 183, lines 1-3, 6-13). [KSBE FOF550]

957. Similarly, in calculating how many lots were being cultivated for taro, WWCA also included those parcels that were **not** awarded to claimants by the Land Commission. Therefore, WWCA's conclusions as to the total number of lots that allegedly cultivated taro merely consisted of the lots that claimants requested for taro cultivation on the LCA applications. In fact, there is no way to know exactly how much land was actually in cultivation during the Mahele. (Shimizu Tr. 4/3/96 at 172, lines 20-25; at 175, lines 1-4; at 198, lines 1-4). [KSBE FOF551]

958. The law of **[1815] 1850** limited the lands that could be awarded to those lands that were already in cultivation at the time of the application. Consequently, WWCA's data regarding the total number of *loi* cultivated failed to take into account which *lo'i* were weed grown and which were in actual cultivation at the time of the applications. Aside from the *lo'i* that were on the boundaries of other parcels, WWCA included all references to *lo'i* that were both in cultivation and not in cultivation. (Shimizu Tr. 4/3/96 at 190, lines 18-25; at 191, lines 1-23; at 194, lines 18-23; at 196, lines 1-24; at 193, lines 12-18). [KSBE FOF552]

959. In the Waiahole Agricultural Park and Kahana Valley areas, some of the parcels contained *kula* lands. *Kula* lands are lands which could be used for any type of cultivation, not just *lo'i*. If the type of cultivation was specific to *lo'i*, then the awards would state that it was *lo'i*. (Kahalewai Tr. 5/01/96 at 46, lines 1-12). [KSBE FOF553]

960. *Kula* lands generally meant that the area was in banana or dryland taro cultivation. (Kahalewai Tr. 5/01/96 at 46, lines 22-25). [KSBE FOF554]

### **3. Natural Resource Rights**

961. **[Water] Lilikala Kameeleihiwa testified that water** was worshipped since the ancient times. (Kameeleihiwa Tr. 4/3/96 at 11, lines 15-16). There were two

(2) sources of water in traditional Hawaii: one is from the sky, which is a male kind of water which comes from the rain, and the second is from the earth which is represented by the female. (Kameeleihiwa Tr. 4/3/96 at 11, lines 22-25, at 12, lines 1-3). The water that comes from the earth is called *Kaneikawaiola*. (Kameeleihiwa Tr. 4/3/96 at 12, lines 3-5). [KSBE FOF521]

962. [To] **Nalei Kahakalau testified that to** Native Hawaiians, water signifies life and is affectionately called, "ka wai ola o Kane," the life giving water of Kane. An abundance of water (waiwai) is equivalent to prosperity, wealth, and power. In addition to being the major life force for crops, water signifies life on other levels. Thus, man is the god Kane's living water gourd (He huewai ola ke kanaka na Kane). **[Id.] Written direct testimony of N. Kahakalau**, p. 9, par. 24. [OHA FOFIV.D.9.]

963. [In] **Davianna McGregor testified that in** accordance with Hawaiian spiritual beliefs, freshwater sources are the life force of Kane-i-ka-wai-ola, Hawaiian god/akua of freshwater sources and springs. The Waiahole Ditch system sucks out the life force of Kane as if it were sucking out blood from a human. **McGregor** Tr. April 16, 1996 at p. 38, ll. 1-6. [OHA FOFIV.D.3.]

964. Thus, there is no question that an *ali'i* could establish a *kapu* over a certain area of land to exclude people or limit what could be done on it, determining the time that *kapu* would exist and adjusting it or extending it as he sees fit. The *ali'i* could also assign a certain area of land in an *ahupua'a* within his jurisdiction to a given *konohiki*, and then the *ali'i* could require that certain products be provided to him. These assigned lands were fairly well-identified, and the *ali'i's* or *konohiki's* right to direct activities included the use of water, use of given pieces of land, and use of methods. The *konohiki* would have the authority to regulate how certain gathering rights were to be exercised. In general, a wise *konohiki* would ask for what the land would produce and his people could provide without too much harm. (McGregor Tr. 2/22/96 at 103, lines 5-25; at 104, lines 1-25; at 105, lines 1-25; at 106, lines 1-10). [KSBE FOF522]

965. Conservation practices regarding freshwater **[was] were** also observed, and included the cleaning and maintenance of the freshwater sources such as springs, waterfalls, *'auwai*, streams and rivers. (Ching Tr. 12/20/95 at 17, lines 8-11). Strict rules designed to ensure that these water resources were not polluted or otherwise contaminated were enforced and, in addition, freshwater was regulated so that every *lo'i* had enough water to fulfill its need. (Ching Tr. 12/20/95 at 17, lines 11-15). [KSBE FOF523]

966. The extraction of water from the ground before it reaches the surface or flows into streams or springs is not a traditional and customary Native Hawaiian resource

management practice. It is an aberration. *Id.*, at p. 44, ll. 3 - 6. Native Hawaiian custom and practice is to use the streams to supply water for domestic use and for gathering stream life, and for other subsistence, cultural, and religious practices. The ground water would remain in the water table to sustain the natural resources of the land and the ocean, *id.*, at p. 44, l. 25-p. 45, l. 5, the nature deities of Native Hawaiians. **McGregor**, Ex. M-47, at p. 7. [OHA FOFIV.D.2.]

#### 4. Transporting Water between Ahupua‘as

967. It is a traditional Hawaiian custom and practice to move water from a wet area to a dry area. Examples include the Kamehameha Ditch and Menehune Ditch. Kennedy, WRT, 10/16/95, P10-11; Johnson, WRT, 10/16/95, P5-6. [WIC FOF293]

968. Generally, water was **not** transported from one *ahupua‘a* to another because there was no need to do so. (Ching Tr. 12/20/95 at 19, lines 4-6). However, there is **at least** one instance where water was transferred by ‘*auwai* from Maulili Pond and the *ahupua‘a* of Koloa to the *ahupua‘a* of Wiliwili in the district of Kona on the Island of Kauai. (Ching Tr. 12/20/95 at 19, lines 6-10). [KSBE FOF524]

969. There is also a reference that this happened between the *ahupua‘a* of Waiawa and the *ahupua‘a* of Manana located in the land district of Ewa, on the Island of Oahu. (Ching Tr. 12/20/95 at 19, lines 11-13). This observation was made by E.S. Craighill Handy in the Hawaiian Planter: His Plants, Methods and Areas of Cultivation, Volume 1, Bernice Pauahi Bishop Museum, Bulletin 161 dated 1940. (Ching Tr. 12/20/95 at 19, lines 16-19). [KSBE FOF525]

970. Although Dr. Handy does not note the method of transportation of the water from Waiawa to Manana, Dr. Handy mentioned that the lower terraces of Manana were watered by the Waiawa Stream. (Ching Tr. 12/20/95 at 19, lines 20-23). This irrigation had to have occurred through water channels or ditches called ‘*auwai* because all wet agricultural fields derived their water from ‘*auwai* no matter what the water source was. (Ching Tr. 12/20/95 at 19, lines 20-25, at 20, line 1). [KSBE FOF526]

971. Proper resource management and water conservation by Native Hawaiians are essential. The Menehune Ditch is an example of proper resource engineering and conservation by the Hawaiians in a flood situation where the taro planted at sea level would be ruined during the annual Waimea flood. To solve this problem, where the rivers meet at Waimea and Makaweli, there is a tremendous amount of water running into Waimea which they took to feed the dry side of the *ahupua‘a*. This is an example of the scientific acumen of the Hawaiians that can be applied to the current issue of this Waiahole Ditch case. (Johnson Tr. 4/11/96 at 199, lines 17-25; at 200, lines 1-25). [KSBE FOF529]

972. Although there are several kinds of sharing, sharing is a very Hawaiian value. Generally, sharing is done within one's *ohana* which is larger than the confinement of the *ahupua'a* because it is a more general group. *Ohana* could be spread out such that one could have *ohana* in Kauai and *ohana* in Molokai, therefore covering a wider range of sharing broader than the confines of the *ahupua'a* and not limited by geography. (Johnson Tr. 4/11/96 at 210, lines 3-25; at 211, lines 1-25; at 21, lines 1-11). [KSBE FOF532]

973. In the ancient days, the *ali'i 'ai ahupua'a* on all sides of the summit had a right of access to the dike water system so there was no need to move the dike water. But, this does not mean that there is no precedent for moving water from one *ahupua'a* to another. In fact, in the ancient days, there were instances where the king allowed the water to be moved from an abundant area to a nonabundant area, especially from a wet to dry area. (Johnson Tr. 4/11/96 at 215, lines 11-25; at 216, lines 1-19). [KSBE FOF534]

974. Some of the projects undertaken by the native Hawaiians included widening and deepening the mouth of Pearl Harbor by Keaunui to make a better way for canoes and larger vessels to go in and out of the harbor safely and an irrigation tunnel called *Waiapuka* which moved water from a stream to a dry area to irrigate the *kalo* and the *lo'i*. Kamehameha dug nineteen (19) shafts about four (4) feet in diameter and connected them at the level of the stream using a downstream momentum to divert the water into the dry fields. The principal is very similar to that used by the Waiahole Ditch gravity flow. (Eaton Tr. 4/17/96 at 159, lines 18-25, and 160, lines 1-8). [KSBE FOF537]

975. According to Hawaiian traditions, freshwater was only used for the growing of *kalo*. It was only diverted from the streams for the growing of *kalo* and not for any other crop. (Kameeleihiwa Tr. 4/3/96 at 13, lines 8-14). The growing of wetland *kalo* was considered the most efficient use of the land because you could grow ten (10) to fifteen (15) times more *kalo* per acre **[within a] with** wetland taro **[then] than** with **[a]** dryland taro. So as the population grew, this was something that was considered very important in that it was necessary to feed many more people. (Kameeleihiwa Tr. 4/3/96 at 13, lines 15-21). [KSBE FOF540]

976. Water that was diverted was very carefully watched so that when the water diversion was made, no more than half of the water will be diverted into a particular *lo'i* or a set of *lo'i*. (Kameeleihiwa Tr. 4/3/96 at 14, lines 4-7). [KSBE FOF541]

977. The significance of the areas of Waiahole-Waikane can be ascertained by breaking down their names. The word "*wai*" indicates that the particular area is rich with water, and the word "*kane*" indicates that the water is derived from that particular god. The word "*ahole*" of Waiahole indicates that a particular fish lives

there or that the water is very rich in nutrients. (Kanahele Tr. 5/7/96 at 26, lines 13-25, at 27, lines 1-3). [KSBE FOF542]

978. There are also some Leeward areas that also have "*wai*" and have significant connotations to their names. For example, Waipahu means that there is a underground water basal lens. Waiawa means "bitter water". Waikele means the ground is very wet and soft. (Kanahele Tr. 5/7/96 at 34, lines 17-25, 35, lines 1-5). [KSBE FOF543]

979. With respect to productivity for agricultural purposes, while wetland taro may be concentrated on the windward coast, the Leeward side would also have sweet potato farms and **[may be] maybe** dryland taro, and if there **[was] were** ponds of fresh water springs then, wetland taro. (Kanahele Tr. 5/7/96 at 37, lines 10-20). [KSBE FOF544]

980. The Hawaiian people established a substantial amount of land management by establishing water courses such as the '*auwais* to take water where they needed it. They also terraced land and changed it to make it suitable to them, using technology to the maximum and adopting new technology when beneficial. (Tr. 2/22/96 at 106, lines 11-25; at 107, lines 1-5, 18-25). In fact, there is also evidence of the Hawaiians digging wells, like on the Island of Kahoolawe. (McGregor Tr. 2/22/96 at 111, lines 12-20). [KSBE FOF545]

981. Generally, water use and apportionment were highly controlled by the chiefs, and not by the *ohana*, although ultimate authority rested with the king when there was a king. (McGregor Tr. 2/22/96 at 36, lines 23-25; at 37, lines 1-2; at 38, lines 18-25; at 39, lines 1-14). Even if the *ohana* had input, the chiefs were also the ones to control how water was to be used in the '*auwais*. (McGregor Tr. 2/22/96 at 37, lines 15-23). [KSBE FOF546]

## **5. Maintenance of Streams and 'Auwais**

982. Water privileges were earned through participation in the construction of the irrigation systems, maintenance of the '*auwai* system, and retained only by the productive application of the waters. Basically, it was a very structured irrigation system of how water got delivered to various lands. While not necessarily common, it was not forbidden that a stream could serve more than one *ahupua'a*. (McGregor Tr. 2/22/96 at 38, lines 7-17; at 39, lines 15-25; at 40, lines 3-23). [KSBE FOF547]

983. It was customary for all those that grew taro to take care and clean the '*auwai*, usually every six (6) months. (Paglinawan Tr. 4/10/96 at 294, lines 19-23; at 295, lines 22-24). After the flume, which was built to bring the diverted water

across the Waiahole Stream, was broken and never fixed, maintenance of the 'auwai was affected. (Paglinawan Tr. 4/10/96 at 290, lines 4-9; at 296, lines 3-23). This was the flume which fed the [Kaia] Kaya lo'i, forcing the [Kaia] Kaya family to close their taro lo'i. Thereafter, some of the 'auwais in the Waiahole Valley were neglected and no longer maintained. (Paglinawan Tr. 4/10/96 at 296, lines 3-23). [KSBE FOF548]

984. Generally, there are many factors which contributed to the change in the valleys in terms of taro, etc. This includes the fact that the streams and 'auwais are not being cleaned anymore as only those who were actively planting maintained them. For example, when Kupau decided that the flume or 'auwai that passed through his lot would no longer serve the [Kaia] Kaya, the [Kaia] Kaya stopped planting after unsuccessfully attempting to access another route that was, perhaps, an area at a different elevation and by using a ductile iron pipe. Hence, it was not necessarily that the stream flow decreased between the time the 'auwai was stopped and the time they tried to use the ductile pipe. A lot could be contributed to coincidence. (McGregor Tr. 4/16/96 at 52, lines 14-25; at 53, lines 1-25; at 54, lines 1-25; at 55, lines 1-25; at 56, lines 1-25; at 57, lines 1-8). [KSBE FOF549]

985. During the late 1950s or early 60s, the auwai were regularly cleaned. Many auwai are not maintained today. McGregor, Tr., 4/16/96, P52/L14-P53/L13; Paglinawan, Tr., 4/10/96, P294-96. Over the years the streams have become clogged with vegetation. Medeiros, Tr., 4/4/96, P80. [WIC FOF291]

## **6. History of Hawaii and Taro**

986. It is a traditional Hawaiian custom and practice for native Hawaiians to gather or to grow taro on kuleana land for subsistence, culture or religious purposes. [WIC FOF271]

987. Before 1778, prior to the date of western contact, the region of Oahu, from Waimanalo all the way to Laie, was an extensive taro producing region of this island. The archaeological evidence suggests that there was a lot of taro being grown in this area and in Waiahole in particular. (Kennedy Tr. 4/11/96 at 147, lines 3-10). [KSBE FOF1596]

988. It is reasonable to assume that in 1778, when Captain King's (Cook's co-captain) population estimates were made, that the area was still a taro basket for the island of Oahu and that lots of taro [was] were being consumed. (Kennedy Tr. 4/11/96 at 147, lines 22-25 and at 148, line 1). In addition, lots of taro [was] were being moved around through the redistribution system and Waiahole was a very active and productive place. (Kennedy Tr. 4/11/96 at 148, lines 1-3). [KSBE



FOF1597]

989. Between 1778 and 1805, the population of the district dropped to a figure of 6,704. This drop in population is attributed to a disease called *Ma'i oku'u*, which is conventionally known as the squatting disease, [the] which was probably bubonic plague, cholera, or typhus. This disease took a alarming number of lives, especially among the Hawaiian community. It has been conservatively estimated that one-third (1/3[rd]), or one (1) out of every three (3) Hawaiians died of this disease alone around the turn of the century. (Kennedy Tr. 4/11/96 at 148, lines 7-17). [KSBE FOF1598]

990. The drop in the number of Hawaiians during the nineteenth century can also be attributed to the outbreak of small pox, which was an epidemic that hit Oahu in the 1850's. Approximately 8,000 native Hawaiians died from this disease. (Kennedy Tr. 4/11/96 at 148, lines 18-24). [KSBE FOF1599]

991. In 1835, the population of Koolaupoko was 4,821. (Kennedy Tr. 4/11/96 at 149, lines 8-9). The population of Waiahole Valley at this time was 210 people. (Kennedy Tr. 4/11/96 at 149, lines 10-12). [KSBE FOF1600]

992. Around this time, there was a great out-migration from places like Waiahole since people needed cash. (Kennedy Tr. 4/11/96 at 149, lines 15-19). There was a quest for the collection [and] of sandalwood which took a lot of healthy young men who normally would be out taro farming and sent them to the mountains to cut sandalwood to fill the ships. (Kennedy Tr. 4/11/96 at 150, lines 1-6). [KSBE FOF1601]

993. As such, there were three (3) powerful things happening at the same time which attributed to the decrease[d] in the population of Waiahole. They were disease, money and human curiosity for adventure. (Kennedy Tr. 4/11/96 at 150, lines 7-9). [KSBE FOF1602]

994. Waiahole was a limited taro farming community. Taro is a very labor intensive crop. Taro does not take care of itself very well, especially in an environment such as Waiahole where there were ponded fields and high energy stream action, which needed to be regulated. (Kennedy Tr. 4/11/96 at 150, lines 13-19). [KSBE FOF1603]

995. At the time of the *Mahele*, the population of Koolaupoko was reduced to 2,800 people. In Waiahole, the estimated population was 100. (Kennedy Tr. 4/11/96 at 150, lines 20-24). [KSBE FOF1604]

996. Between 1860 through 1872, the population of Koolaupoko hit an all time low. The population estimates for Koolaupoko are about 2,000 people. (Kennedy Tr. 4/11/96 at 151, lines 8-12). Beginning sometime in the 1870's, the population of Koolaupoko began picking up which coincided with the arrival of Chinese and Japanese farmers. (Kennedy Tr. 4/11/96 at 151, lines 12-15). [KSBE FOF1605]

997. When Chinese and Japanese farmers arrived to places like Ahuimanu or Waiahole, they found many abandoned taro *lo'i*, which were handy for rice production. These farmers reflooded terraces, probably to get the weeds off, cleared the *'auwai*, reflooded them and grew rice where taro once had been. (Kennedy Tr. 4/11/96 at 151, lines 16-24). Rice production in this area didn't last for very long primarily due to pest, fungus, birds and the out-migration of Chinese farmers. (Kennedy Tr. 4/11/96 at 151, line 25 and at 152, lines 1-2). [KSBE FOF1606]

998. In 1916, rice production had failed and in its place came pineapple and pasturage. Coincidentally, at the same time, there was the opening of the Waiahole Ditch. (Kennedy Tr. 4/11/96 at 152, lines 2-6). [KSBE FOF1607]

999. Between 1930 through 1940, there was a resuscitation of taro growing in Waiahole. This resuscitation was engineered by *Kuleana* members and Hawaiian community members who maintained the tradition. (Kennedy Tr. 4/11/96 at 152, lines 17-23). [KSBE FOF1608]

1000. The resurgence of taro planting in 1935 was mainly by Chinese and Japanese taro farmers planting it for commercial purposes. (McGregor Tr. 4/16/96 at 52, lines 1-13). [KSBE FOF586, WIC FOF275]

1001. In 1962, the Waiahole Poi Factory was still in operation and owned by a man named Sakai. At this time, there were three (3) Japanese and two (2) Filipino[s] families growing taro in Waiahole. (Kennedy Tr. 4/11/96 at 153, lines 3-7). [KSBE FOF1609]

1002. Since the Mahele, most of the families raising taro in the Waiahole/Waikane Valley have been Japanese, Chinese or Filipino families. Kennedy, Tr., 4/11/96, P152/L17-P153/L10; Roberts, Tr., 4/4/96, P65. [WIC FOF274]

1003. The great out-migration of people from Waiahole and the loss of the Hawaiian culture in Waiahole sixty (60) years ago **probably** did not have anything to do with the ditch. (Kennedy Tr. 4/11/96 at 153, lines 20-24). To say that the Waiahole Ditch stole the water and killed taro in Waiahole is a simplistic view of what was really happening. (Kennedy Tr. 4/11/96 at 155, lines 18-23). [KSBE FOF1610]

1004. Windward residents stated in interviews that taro farming declined over the years because residents left the farms to pursue education and greater career opportunities. Ex. M-46A [WIC FOF273]

1005. The idea of running water is not a foreign idea to Hawaiians because they were masters at it. (Kennedy Tr. 4/11/96 at 175, lines 9-12). There are hundreds of miles of diversion ditches all over the State. (Kennedy Tr. 4/11/96 at 175, lines 13-14). However, it was very rare that water was diverted out of an *ahupua'a*. (Kennedy Tr. 4/11/96 at 175, lines 16-19). [KSBE FOF1612]

## **7. Health and Nutrition of Native Hawaiians**

1006. Although Hawaii is the healthiest state in the country, the Native Hawaiian population has the worst health in the nation. Their mortality rates surge to such high levels **partly** because Hawaiians partake in the high-fat American diet. (Shintani Tr. 4/10/96 at 151, lines 1-4; at 152, lines 15-25). [KSBE FOF1578]

1007. **[This] The** Native Hawaiian diet includes *poi*, taro, sweet potato, breadfruit, greens, seaweed, fish, and other kinds of staples. (Shintani Tr. 4/10/96 at 152, line 25; at 153, lines 1, 13-17). [KSBE FOF1579]

1008. In comparing the two (2) types of taro, wetland taro is important because it furnishes the kind of *poi* that Hawaiians are willing to consume. However, certain people do prefer *poi* made from dryland taro. These people often live in areas where they do not have access to the wetland taro. (Shintani Tr. 4/10/96 at 157, lines 1-19). [KSBE FOF1580]

1009. Many other healthful foods, aside from *poi*, would equally strengthen the health of Native Hawaiians. However, many Hawaiians only want to eat wetland *poi*. (Shintani Tr. 4/10/96 at 158, lines 1-5). [KSBE FOF1581]

1010. There are less than 5,000 pure Hawaiians left. However, the disappearance of pure-blooded Hawaiians is largely due to their marrying outside of the Hawaiian race. Most people in Hawaii marry outside their race, and approximately forty-five percent (45%) of Hawaiians do so. (Hughes Tr. 03/14/96 at 92, lines 5-8; at 98, lines 6-24). [KSBE FOF1582]

1011. Hawaiians grew over 300 kinds of taro that they used for various purposes such as eating, medicine and for ceremony. (Hughes Tr. 03/14/96 at 97, lines 17-23). [KSBE FOF1583]

1012. The nutritional value of wetland taro remains the same regardless of where

it is grown on the island. The quality of taro probably depends more upon the particular type of soil and the amount of water that is used. (Hughes Tr. 03/14/96 at 104, lines 22-25; at 105, lines 1-4). [KSBE FOF1584]

1013. As consumers, our *poi* is made up of a [**mix**] variety of taro that comes from different parts of the island. Therefore, it is also difficult to decide if one area grows tastier taro than another area. (Hughes Tr. 03/14/96 at 105, lines 8-17). [KSBE FOF1585]

1014. It is highly unlikely that taro grown in the Waiahole area would be more nutritional than taro grown on other parts of the island. Taro used to be grown throughout the entire state; therefore, it should be just as nutritional and tasty no matter where it is grown in Hawaii. (Hughes Tr. 03/14/96 at 106, lines 15-23). [KSBE FOF1586]

1015. If sufficient [**qualities**] **quantities** of *luau* leaves were not available, it would be equally nutritionally beneficial to consume large quantities of spinach. Currently this substitution is being made. (Hughes Tr. 03/14/96 at 115, lines 18-23). [KSBE FOF1587]

1016. Generally, people should eat more natural, whole and unprocessed foods. Grains and vegetables should also be consumed in larger quantities. Apart from Hawaiian foods, these whole foods are available in large quantities to the general public. (Hughes Tr. 03/14/96, at 120, lines 24-25; at 121, lines 1-10). [KSBE FOF1588]

## **8. Native Hawaiian Education of Taro**

1017. Kukulu Kumuhana is a program in Waipio Valley aimed at teaching traditional Hawaiian values to youngsters. It attempts to incorporate the concept of the taro *lo'i* into traditional Department of Education ("DOE") classes like language arts, math, and science. It also incorporates nutrition and home economics into this curriculum. (K. Kahakalau Tr. 4/11/96 at 43, lines 21-24; at 46, lines 12-25; at 47, lines 1-11; at 48, lines 2-10, 16-20). [KSBE FOF1589]

1018. The program also incorporates computer technology training to enable students to adequately survive in the modern world. However, Kukulu Kumuhana primarily uses the environment as the classroom. (K. Kahakalau Tr. 4/11/96 at 50, lines 7-8, 16-20; at 52, lines 16-20). [KSBE FOF1590]

1019. Kukulu Kumuhana teaches students simple economic lessons on marketing taro. This is done primarily on a theoretical level because the program only utilizes

one *lo'i*. (K. Kahakalau Tr. 4/11/96 at 59, lines 14-24). [KSBE FOF1591]

1020. The religious elements that the Kukulu Kumuhana program teaches do not stem from a formal structure. Instead, the spirituality that the program teaches comes from the student's feelings and inner thoughts. The Hawaiian's formal religion was abandoned long ago. (K. Kahakalau Tr. 4/11/96 at 79, lines 3-5, 7-9, 14-16, 22-23). [KSBE FOF1592]

1021. Since Kukulu Kumuhana is a community-based educational program, the founders have also gone into other communities where wetland taro cannot be grown.

In these communities, other focal points are substituted for the taro *lo'i* to generate the same kind of educational value. For example, in Ka'u, Kona and Puna, the spiritual practices, proverbs, arts, and language all focus around fishing. (K. Kahakalau Tr. 4/11/96 at 68, lines 16-25; at 69, lines 1-11). [KSBE FOF1593]

## **9. Taro Cultivation**

1022. Not all the taro is used for eating when one farms for subsistence. Some taro is raised for purely cultural reasons. Others are raised for offerings to the gods or for medicinal purposes. (N. Kahakalau Tr. 4/11/96 at 12, lines 19-24). [KSBE FOF1594]

1023. Farming dryland taro is culturally valuable. The taro represents the body of *Kane*, and the sunlight needed to grow dryland taro also encompasses one of the forms of his body. The water required to grow wetland taro is also culturally and spiritually significant. (N. Kahakalau Tr. 4/11/96 at 40, lines 13-23). [KSBE FOF1595]

1024. The fact that a taro farmer who lives on his own farm and cultivates his own crop of taro, perhaps with the help of his 'ohana, may sell some of that crop that is surplus to the 'ohana's requirements to people outside his 'ohana does not contradict the traditional concept of subsistence farming, since the crop is not being grown primarily for commercial purposes. [*Id.*] **McGregor** at p. 49 ll. 2-13. [OHA FOFIV.A.5.b.]

1025. Taro cultivation and fishing were the centerpieces of the material culture of Hawaiians. McGregor Tr. February 22, 1996, at p. 14, ll. 2-3. [OHA FOFIV.A.6.]

1026. Taro (*kalo*) and water (*wai*) are important to the spiritual, cultural, and social well-being of Native Hawaiian people, traditionally and in contemporary society. In Hawaiian tradition, the relationship between Native Hawaiians and taro goes back to

the beginning of time. The taro plant is the older sibling of the Native Hawaiian people. According to Hawaiian tradition, then, a familial relationship exists between kalo and man. Kalo, being the older sibling, is responsible for the provision and nourishment of man. In turn, man, the younger sibling, must respect and take care of the kalo. Parts of the taro plant possess human qualities: the piko, the center of the leaves, corresponds to the navel; the ha, or stem, corresponds to the breath; the hululu, or rootlets, correspond to body hair; and the maka or sprouts correspond to the eyes. Native Hawaiians are required by tradition to respect and take care of the taro. Written Direct Testimony of Nalei Kahakalau, p. 3, par. 8, p. 4, par. 10, p. 7, par. 17. In order for young Hawaiians of today to completely understand and relate to their past, they must understand this relationship to taro. Thus, it is essential that taro continue to be cultivated in the traditional manner and that poi continue to be produced from that taro. *Id.*, at p. 7, par. 18-19. [OHA FOFIV.D.5.]

1027. **Pualani Kanahele testified that** Native Hawaiians consider taro the most sacred plant in their realm because it is primordial, the staff of Hawaiian life. The realm of taro is the realm of Kane; therefore, taro is physically, psychically, and spiritually Kane. Taro is the element provided by Kane to feed Hawaiians, to give Hawaiians the example and experience of family ties. It forces Hawaiians to commit themselves to the care of flowing water and rich fertile land in order to have Kane's presence constantly with them. **Kanahele**, Ex. M-118 at p. 4, par. 15. [OHA FOFIV.D.6.]

1028. **[Taro] Nalei Kahakalau testified that taro** cultivation has spiritual meaning to the Native Hawaiians, for taro is the body form (kino lau) of one of the Hawaiians' major gods, Kane. Kane can also take the form of fresh water and sunlight. Thus, Hawaiian taro farmers believe that in cultivating taro they derive strength and power from three sources: the taro itself, the water and the sunlight. Written Direct Testimony of Nalei Kahakalau, p. 5, par. 11, 12. Tr. April 11, 1996 at p. 39, ll. 7-24. [OHA FOFIV.D.7.]

1029. The importance of taro in the Native Hawaiian culture is exemplified by the fact that taro is offered as a ho'okupu, or gift, to all the Hawaiian akua (gods) and aumakua (ancestral or family gods). The water caught in the taro leaf, especially of the apuwai taro with its cuplike leaves, is considered pure because it has not touched the ground and is used by Native Hawaiians in religious ceremonies. **[Id.,] N. Kahakalau**, p. 5, par. 13 - p. 7, par. 17. [OHA FOFIV.D.8.]

1030. An adequate water supply from running streams is essential to the formation of large well-shaped taro corms, otherwise "pu'ali ke kalo i ka wai 'ole." (Without water, taro will be misshapen). **[Id.] N. Kahakalau**, p.9-10, par. 25 [OHA FOFIV.D.10.]

1031. The irrigation water flowing out of a taro lo'i contains organisms that contribute to the biomass of the stream. Although the water coming from a taro lo'i might be a degree or two warmer than it was when it flowed into the lo'i, if the stream into which the lo'i water flows has a good flow the lo'i water would simply mix in with the stream water and no change in the stream water would be detectable. **Lowe** Tr. February 29, 1996 at p. 140, ll. 5 - 6, 8 - 12. [OHA FOFIV.D.11.]

1032. The children of the residents of the Waiahole, Waikane, and Kahana Valleys have indicated a renewed interest in taro cultivation and other subsistence activities. **McGregor** Tr. April 16, 1996 at p. 37, ll. 11-13. [OHA FOFIV.D.13.]

1033. Children of the Native Hawaiian taro farmers in the area from Waiahole to Kahana are perpetuating their cultural heritage by engaging in the traditional and customary methods of taro cultivation by actually working in the lo'i and producing taro and poi. **Fukumitsu** Tr. April 4, 1996, at p. 138, ll.13-17. [OHA FOFIV.D.14.]

1034. Most wetland taro farmers are not full time commercial growers. They are part-time and profit is not their main motivation. **Ferguson** Tr. February 20, 1996 at p. 109, ll. 14-16. [OHA FOFIV.D.15.]

1035. On all of Oahu, there is only one DHHL lot that is being used for taro purposes. That lot is an experimental project that is actually used for cultivating snails. The water drains down to a taro patch. Agard, Tr., 5/7/96, P17/L7-12. [WIC FOF283]

1036. Based on the experiences over the past 75 years and how many taro farmers DHHL has on their homelands, it is very unlikely that any of their homesteaders will grow wetland taro. Agard, Tr., 5/7/96, P18/L18-20. [WIC FOF284]

## **10. Customs and Practices of Native Hawaiians**

1037. Gathering rights were normally limited to **[residence] residents** of the *ahupua'a* and **[non-residence] non-resident** chiefs such as the *ali'i nui*. (Ching Tr. 12/20/95 at 17, lines 16-18). Non-residents could gather the fruits of the land, provided permission was granted to do so by the caretakers of the land upon which such gathering was desired, and then, only for their own use. (Ching Tr. 12/20/95 at 17, lines 18-21). [KSBE FOF555]

1038. Hawaiian customs and practices encompass a full range of traditional cultural, religious, and subsistence activities in which the native Hawaiian *ohana* have engaged in for many centuries in an effort to live as people and to survive in an unique island

environment. These are customs and practices related to each major aspect of Hawaiian life and livelihood, including community life, family, human well-being and spirituality, natural environment, cultural and ecological resources, rights and economics. (McGregor Tr. 4/16/96 at 24, lines 9-18). [KSBE FOF558]

1039. *Aloha‘aina* is a deeply held concept with Hawaiian *kaona*, or hidden **[meeting] meaning** concealed in Hawaiian language. At its roots, *Aloha‘aina* has a **[tenant] tenet** that the land is both religion and culture. The land and religion are foundations of Hawaiian culture, beliefs, and practices. (McGregor Tr. 4/16/96 at 24, lines 25, at 25, lines 1-4). [KSBE FOF560, OHA FOFIV.B.2]

1040. Land is the foundation of Hawaiian custom and practice; the land is religion. It is alive, respected, treasured, praised, and even worshipped. The land is one hanau, sands of the Hawaiians' birth, and resting place for the Hawaiians' bones. The land lives as do the ‘uhane, or spirits of all Hawaiian ancestors who nurtured both physical and spiritual relationships with the land. **McGregor**, Ex. M-47 at p. 7. The land/religion are the foundations of Native Hawaiian culture and beliefs, and the practice of Hawaiian customs and traditions. The essence and soul of Hawaiian culture would die without the land. *Id.*, at p. 8. [OHA FOFIV.B.1.]

1041. When Hawaiians live and work on the land they become knowledgeable of the life of the land. In their daily activities, they develop a partnership with the land so as to know when to plant, fish, or heal their minds and bodies according to the ever changing weather, seasons and moons. **McGregor**, Ex. M-47 at p. 8. [OHA FOFIV.B.3.]

1042. Resources that are essential to the conduct of Hawaiian subsistence, customs, traditions, and practices include, but are not limited to:

a. Areas of naturally occurring or cultivated sources of food, medicine, and shelter:

(1) Fresh water in streams, springs, ponds, and wetlands for gathering freshwater aquatic resources, and for drinking, healing, and domestic uses and to supply the irrigation networks, including ‘auwai, installed for cultivating taro.

(2) Shorelines, reefs, and the ocean itself, for gathering marine foods, medicine, and salt, and for conducting cultural and spiritual customs and practices.

(3) Forests for hunting pigs, deer, goats, birds, etc., and for gathering flora used for food, household goods, arts, crafts, construction materials, cultivation, firewood, decoration, adornment, ritual offerings, and for conducting spiritual practices.

b. Habitats of naturally occurring or cultivated endangered terrestrial and marine native flora and fauna, including plant and animal materials used for



medicinal purposes.

c. Access to the cultural resources and use areas over trails and dirt roads mauka to streams, springs, and forests and makai to streams, wetlands, and the ocean. **McGregor**, Ex. M-47 at pp. 13-14. [OHA FOFIV.B.4.]

1043. Resources that are essential for the expression and perpetuation of Hawaiian culture, religion, and language include, but are not limited to:

a. Wahi pana, which are sacred areas and sites including heiau, shrines, burial caves and graves, house sites, and other traditional use areas. Natural and cultural areas believed to be traditional domains of ancestral spirits and Hawaiian deities where Hawaiians renew their ties to ancestors through experiencing natural phenomena and witnessing ho‘ailona (signs) are also wahi pana.

b. Knowledge of historical and contemporary religious beliefs, customs, and practices related to an area.

c. Habitats of naturally occurring or cultivated endangered terrestrial and marine native flora and fauna used for cultural and religious ceremonies, rituals, arts, crafts, and related activities.

d. Natural, cultural, and community resources for perpetuation of language, especially place names.

e. Natural and community resources for cultural forms of art, craft, music and dance. [*Id.*] **McGregor**, at p.14. [OHA FOFIV.B.5.]

1044. [**The**] **Pualani Kanahele testified that the** area of Windward O‘ahu from Kane‘ohe to Kahana Valley is significantly important in Native Hawaiian history, culture, religious beliefs, and traditions. **Kanahele** Tr. May 7, 1996, at p. 24, l. 15-p. 27, l. 3; Ex. M-111A, at p. 5, par. 10. Waikane Valley has special meaning in the Hawaiian religion: Waikane means Kane's water; it is the valley where Kane, in human form, came from Kahiki (Tahiti) and opened a spring. *Id.*, at p. 2, par. 12. Kane is the chief deity among Hawaiian gods. The name Kane is the male symbol for the procreative force. **Kanahele**, Ex. M-118, at p. 2, par. 11. Native Hawaiians believe that the gods Kane and Kanaloa especially looked for groundwater on O‘ahu in the region of Waikane and Waiahole Valleys in preparation for the coming of man. **Kanahele** Tr. May 7, 1996, at p. 25, ll. 18 - 22. Kane put his spear into the ground at Waikane and water came flowing out. *Id.*, at p. 36, ll. 3 -4. Waikane is considered a pu‘uhonua (a place of refuge, asylum, place of peace and safety) for the district of Ko‘olaupoko and is considered in conjunction with the sacred land of Kualoa. Kualoa was the land dedicated to Lono, god of fertility and agriculture. Restoration of the "water of Kane", Waikane stream in Waikane Valley, is vital to the restoration of the Hawaiians' spiritual and cultural heritage. **Kanahele**, Ex. M-118, at p. 3, par. 14. [OHA FOFIV.C.1.]

1045. [**The**] **Pualani Kanahele testified that the** tradition of Kane from Kane‘ohe

to Kualoa is the oldest tradition Hawaiians have. **Kanahale**, Ex. M-118 at p.4, par. 15. Kualoa, in the region between Kane'ohe and Kahana Bay is the traditional birthplace of the Hawaiian people. Waikane is the source of water from Kane, one of the most powerful of Hawaiian gods. **Kanahale** Tr. May 7, 1996 at p. 42, ll. 16 - 23. Kualoa is the connection between Hawai'i and Rapanui and the original priesthoods of Polynesia. *Id.*, at p. 43, ll. 8 - 9 [OHA FOFIV.C.2.]

1046. "Subsistence" is the traditional and customary uses of wild and cultivated renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, transportation, culture, religion, and medicine for barter or sharing, for personal or family consumption, and for customary trade. (McGregor Tr. 4/16/96 at 24, lines 19-24). [KSBE FOF559, WIC FOF296, WWCA FOF452]

1047. What distinguishes Hawaiian custom and practice is the use of it for the *ohana* subsistence and continued honor and respect of the practitioners for traditional Hawaiian values and respect for the resources and a spiritual connection **[that guides to the land, spiritual connection]** to the land which guides them to subsistence harvesting of natural resources. (McGregor Tr. 04/16/96 at 25, lines 5-12). [KSBE FOF562]

1048. Native Hawaiian customs and practice include, but are not limited to: (1) to only take what is needed for subsistence; (2) not wasting natural resources; (3) to gather according to the life cycle of the resources and allowing the resources to reproduce, such as not catching fish during the spawning seasons; (4) to alternate areas within which to gather fish and hunt so as not to keep returning to the same place and allowing the resources there to replenish themselves; (5) if an area does have a declined resource, to observe a *kapu* on harvesting until it comes back and replant it if necessary; (6) to understand that the resources are always abundant and accessible to those who possess the knowledge about the location and have the skill to obtain them so there is no need to overuse a more accessible area; (7) to respect and protect the knowledge which has been passed down intergenerationally and not to carelessly give it away to outsiders; (8) to respect each other's gathering areas, that usually, within a community, people know where different families go[es] and they respect that; (9) throughout the expedition, to keep **[focussed] focused** on the purpose and goal **of** fishing, hunting, or gathering; (10) to be aware and stay alert to natural elements; (11) to share what is gathered with family, friends and neighbors; (12) to take care of **[kapuna] kupuna** who have passed on their knowledge and are now too old to go out and conduct subsistence activities on their own; (13) to not talk openly about plans of subsistence, hunting, gathering, and fishing; (14) to respect the resources and the spirits of the land, **[forrest] forest**, ocean and refrain from being boisterous; and (15) to respect family *aumakua* by refraining from gathering resources which are sacred to them. (McGregor Tr. 4/16/96 at 26, lines 21-25, at 27, lines 1-3). [KSBE FOF563]

1049. The primary material that the Hoe *ohana* gathers in Waiahole is bamboo and bamboo sticks for nose flutes. C. Hoe crafts 1,800 nose flutes for Kamehameha schools every summer. C. Hoe also uses the bamboo to make another implement called *kala'au*. (C. Hoe Tr. 4/3/96 at 123, lines 21-25; at 124, lines 1-2). [KSBE FOF565]

1050. Under traditional Hawaiian practice, water is not owned by anyone. (McGregor Tr. 4/16/96 at 73, lines 22-24). A *konohiki* could not take water away from one person and give it to another such that it would absolutely deny that person the right of existence and subsistence. (McGregor Tr. 4/16/96 at 73, line 25, at 74, lines 1-3). [KSBE FOF568]

1051. The traditional and customary practices are different for *ali'i* and *maka'ainana*. (McGregor Tr. 4/16/96 at 74, lines 9-11). In addition, it is the *hoa'aina* whose rights are protected for the function of subsistence. (McGregor Tr. 4/16/96 at 75, lines 1-3). [KSBE FOF569]

1052. The *hoa'aina* are caretakers of the land, they depend upon the land for subsistence. So it is their relationship to the land which distinguishes their status. (McGregor Tr. 4/16/96 at 75, lines 11-14). As such, any person, without any Hawaiian ancestry, who had acquired his or her knowledge of Hawaiian history academically, and who have engaged in those activities on land that assumingly is in Hawaii could claim to be a Hawaiian practitioner. (McGregor Tr. 4/16/96 at 77, lines 4-8). [KSBE FOF570]

1053. *Hoa'aina* is the Hawaiian term used to describe the relationship of an ahupua'a tenant to the land. *Hoa'aina* is a steward, caretaker, or friend of the land. [*Id.*] **McGregor**, at p. 11, ll.18-20. The gathering rights of the *hoa'aina*, or the "tenants" who dwelt on the land survived the *Mahele*. *Id.*, at p. 19, l. 5-p. 20, l. 21. [OHA FOFIV.A.17.]

1054. Hawaiians in the precontact period had traditional and customary practices that affected almost each element of their lives. Therefore, immediately after post contact, there was great resistance on the part of some of the Hawaiian *ali'i* to adopt[ing] new practices, with several rebellions arising in response. In particular, the rebellion of Kekuakalani which had to do with free eating was unsuccessful, causing a change in chiefly conditions and customs. In turn, the common people who followed the chiefs with respect to their behaviors and activities had to change their own activities to comport with those of the chiefs. Hence, there was a substantial change in the customs and practices with respect to property at the time of *Mahele* due to the new laws imposed upon the people by the Hawaiian king and the Hawaiian legislature. (McGregor Tr. 2/22/96 at 89, lines 12-25; at 90, lines 1-25; at 91, lines 1-24). [KSBE FOF571]

1055. In the pre-Mahele period, if a person who did not reside within an *ahupua'a* went onto the *ahupua'a* and a conflict arose, the *konohiki* would resolve the problem, especially in cases of an infraction of a *kapu*. Then, the person committing the infraction would not have a choice of penalty either. (McGregor Tr. 2/22/96 at 73, lines 16-25; at 74, lines 1-25; at 75, lines 1-15). [KSBE FOF574]

1056. In traditional Hawaiian times, one who diverted water without permission was killed and the body was used to plug the hole to stop the unpermitted diversion of water. McGregor Tr. February 22, 1996, at p. 35, ll. 5-7. [OHA FOFIV.D.4.]

1057. Ancestors as the real owners of the land refers to stewardship and responsibility over those lands, not private property ownership in the western sense of the word. (McGregor 2/22/96 at 68, lines 15-25; at 69, lines 1-4; at 94, lines 11-19). [KSBE FOF577]

1058. **[The] Davianna McGregor testified that the** chief's responsibility to use natural resources **[over] in** the *ahupua'a* would include using the natural resources for whatever objectives he sees fit. This could include using the resources to educate the Hawaiian children as a traditional, customary practice. For example, if KSBE takes classes to the Waiahole Valley regularly to teach the children about various natural resources up there, that would be consistent with traditional and customary practice. (McGregor Tr. 2/22/96 at 76, lines 15-25; at 77, lines 1-25). [KSBE FOF580]

1059. The customary use of streams was for drinking water and gathering 'o'opu, but custom and practice cannot be applied to the distribution of water in Oahu in terms of water that is artificially drawn up. However, most of the drinking water and water for domestic use is probably from the wells rather than from rivers, streams, or other diversions. Hence, a balance is required so that the natural resources are healthy and the people are protected. (McGregor Tr. 2/22/96 at 43, lines 2-6; at 44, lines 2-25; at 45, lines 1-24). The Leeward versus Windward interests are not necessarily irreconcilable differences. (McGregor Tr. 2/22/96 at 58, lines 1-6). [KSBE FOF581]

1060. The customary and traditional use of wild and cultivated renewable resources is for direct personal or family consumption, not for profit or commercial use. So, if applied to the concept of growing taro in Waiahole Valley, subsistence would not extend to granting water so that people could grow taro for commercial sale. (McGregor Tr. 2/22/96 at 46, lines 18-25; at 47, lines 4-16). [KSBE FOF582]

1061. While the precontact period was qualitatively a subsistence and communal system, it was also a system which provided a substantial surplus for activities other than the daily activities of nourishing oneself, including contributing substantial

amounts of property **for the support of troops** for the waging of war **[for the support of troops]**. (McGregor Tr. 2/22/96 at 92, lines 2-25). [KSBE FOF583]

1062. By the time trade was introduced around the year 1810, society had already many distorted customs and practices. In fact, Kamehameha, who observed traditional and customary practices, had already engaged in trade and had also adopted many other new practices himself. (McGregor Tr. 2/22/96 at 93, lines 15-25; at 94, lines 1-10). [KSBE FOF584]

1063. Many of the residents of the valleys do not depend solely upon the natural resources of the *ahupua'a* for their subsistence as the traditional version of subsistence is not being relied on in today's culture. (McGregor Tr. 4/16/96 at 50, lines 9-20; at 51, lines 1-18). [KSBE FOF585]

1064. In fact, Kamehameha the Third had concerns around the time of the *Mahele* that *hoa'aina* rights were being abridged by the new western concept of ownership, resulting in an act being passed to protect those *hoa'aina* rights. (McGregor Tr. 2/22/96 at 71, lines 16-24). He protected the rights of the *hoa'aina*, the *ohana*, as he also helps define tradition and custom. But, the period after his successors go through changes, but differences do not necessarily diverge from tradition. (McGregor Tr. 4/16/96 at 84, lines 3-15; at 86, lines 21-22). [KSBE FOF588]

1065. More specifically, with respect to *ohanas*, an *ohana* typically consists of hundreds of people that make an extended family. An *ohana* also had a territory or an *'ili*, marked by boundaries of natural features. In today's society, an *ohana* would consist of family relationships of Native Hawaiian ancestry, as well as non-Hawaiians who are related by marriage or *hanai*. Today, the boundaries are also learned and passed on through generations. (McGregor Tr. 2/22/96 at 78, lines 15-20; at 79, lines 1-25; at 80, lines 1-21). [KSBE FOF589]

1066. There would also be traditional and customary rights outside the *ohana* if, for example, someone of Hawaiian ancestry moved into the valley that was not part of the *ohana*. That person would be expected to get to know the people already there and establish a relationship with them in order to learn how to exercise traditional and customary rights. (McGregor Tr. 2/22/96 at 81, lines 8-25; at 82, lines 1-25; at 83, lines 1-9). [KSBE FOF590]

1067. Moreover, someone without Hawaiian ancestry who acquired his or her knowledge of Hawaiian ancestry academically and who engaged in those activities on land in Hawaii could actually claim to be a Hawaiian practitioner, if they have acquired their knowledge from practitioners who preceded them. (McGregor Tr. 4/16/96 at 77, lines 4-15). [KSBE FOF591]

1068. Some aspects of traditional and customary Hawaiian practice have evolved over time, and the increase in population is one of the reasons for the evolution. (McGregor Tr. 2/22/96 at 84, lines 9-15). [KSBE FOF592]

1069. Other aspects of Hawaiian culture which could survive without a land base are language, hula, Hawaiian music and songs. This also includes contemporary adaptations such as the aloha shirts and Kamehameha Day parades. **[By definition, there] There** are actually more Hawaiians today than at the *Mahele*. (McGregor Tr. 4/16/96 at 81, lines 11-22; at 82, lines 8-17). [KSBE FOF593]

1070. There are customs and practices related to each aspect of Hawaiian life-style and livelihood: community life; family; human well-being and spirituality; stewardship and use of natural resources; and rights and economics. Culture may be defined as the traditions, beliefs, practices, life ways, arts, crafts and social institutions of a community that are passed down from generation to generation. **McGregor** Tr. February 22, 1996 at p. 52, l. 18 - p. 53, l. 5; Ex. M-46 at p. 4. [OHA FOFIV.A.1.]

1071. **Davianna McGregor testified that** Native Hawaiians descend from a tradition and genealogy of nature deities: Wakea, Papa, Ho'ohokulani, Hina, Kane, Kanaloa, Lono and Pele, the sky, the earth, the stars, the moon, water, the sea, natural phenomena such as the rain and steam and from native plants and animals. Native Hawaiians today, inheritors of these genes and mana, are the kino lau, or alternate body forms of all their deities. **McGregor**, Ex. M-47, at p. 7. [OHA FOFIV.A.2.]

1072. The distinguishing feature of Hawaiian custom and practice is the observance of 'ohana subsistence and the continued honor and respect of the practitioners for traditional Hawaiian values. The practitioners of Hawaiian custom and tradition also emphasize respect for and spiritual connection with the natural resources that guide them in subsistence harvesting of those resources. Such values and customs include, but are not limited to: taking only what is needed for subsistence and not wasting natural resources; gathering according to the life cycle of the resource and allowing the resource to reproduce; alternating areas within which to fish and hunt; if an area has a declining resource, observing a kapu on harvesting until the resource replenishes itself; replanting and/or restocking if and when appropriate; understanding that the resources are always abundant and accessible to those who possess the knowledge of the locations of such resources and have the skill to obtain them, so there is no need to overuse a more accessible area; **McGregor**, Ex. M-47 at p. 25, ll. 5-25; respecting and protecting the knowledge which has been passed down intergenerationally, not carelessly giving it away to outsiders; respecting each other's gathering areas; remaining focused on the purpose and goal of the fishing, hunting, or gathering expedition; being aware of and alert to the natural elements; sharing what is gathered with family, friends, and neighbors; taking care of kupuna who have

passed on their knowledge and experience and are now too old to go out and conduct subsistence activities on their own; not talking openly about plans for hunting, gathering, and fishing; respecting the resources and the spirits of the land, forest, and ocean, and refraining from boisterous behavior; respecting family ‘aumakua by refraining from gathering resources which are sacred to them. **McGregor** Tr. April 16, 1996 at p. 25, l. 5-p. 27, l. 3; Ex. M-47 at pp.9-10. [OHA FOFIV.A.3.]

1073. In the period between 1400 - 1600, the fourth period preceding the first contact with the white man in the Hawaiian Islands, Tr. February 22, 1996 at p. 12, l. 4, the Native Hawaiians experienced **[geometric] great** population growth and sophisticated innovations in cultivation, irrigation, aquaculture, and fishing. This period saw the construction of major fishponds, irrigation systems, and field cultivation systems. Hawaiian society became stratified into chief, priests, and commoners, but remained predominantly a subsistence agricultural economy centered around the concept of ‘ohana. **[Id.,] McGregor**, at p. 13, ll. 10-23. [OHA FOFIV.A.4.]

1074. a. The Hawaiian social system was organized around the ‘ohana (extended family). This ‘ohana social system concentrated on subsistence production in order to sustain these large extended families. Hawaiian spiritual beliefs, customs, and practices focused on maintaining harmonious and nurturing relationships to the various forces, elements, and beings of nature as ancestral spirits whom the Hawaiians honored as life deities. Tr. February 22, 1996, at p. 12, ll. 13-19. Subsistence is the customary and traditional use of wild and cultivated renewable resources for direct personal or family consumption as food, shelter, fuel, clothing, tools, transportation, culture, religion, and medicine, and for barter or sharing for personal or family consumption, and for customary trade. **[Id.] McGregor**, at p. 46, l. 23 -p. 47, l. 3. [OHA FOFIV.A.5.a.]

1075. The ‘ohana system evolved over a period dating back at least seventeen centuries. **McGregor** Tr. February 22, 1996, at p. 18, ll. 6-9. Throughout the five periods of the pre-contact era, the ‘ohana system continued and formed the foundation of Hawaiian society. **McGregor** Tr. February 22, 1996, at p. 14, ll.9-10. ‘Ohana customs, beliefs, and practices remained intact through and after the period of the chiefs. The ‘ohana system predated the hierarchical system and religious rituals of the chiefs, coexisted with the chiefs' system, and continues today. **McGregor** Tr. February 22, 1996, at p. 90, l. 21-p. 91, l. 2. [OHA FOFIV.A.7.]

1076. The ‘ohana constituted the community within which Hawaiian economic life operated. A system of barter in essential goods existed within the ‘ohana among fishermen, mountain dwellers, and cultivators. Generally, bartering within the ‘ohana functioned primarily to facilitate the sharing of what had been produced upon ancestral lands or lands held by the ‘ohana. **[Id.] McGregor**, at p. 13, l. 24 - p. 14, l. 7. [OHA FOFIV.A.8.]

1077. In the modern context, the ‘ohana includes the grandparents’ generation and all of their relatives, and those who are married into the ‘ohana. Some non-related individuals might be hanai, accepted and raised within the family. **McGregor** Tr. February 22, 1996 at p. 79, ll. 17 - 20. [OHA FOFIV.A.9.]

1078. In modern Hawai‘i, where the ‘ohana have remained strong, the cultivation of the land remains strong and the surrounding resources are quite abundant, because the knowledge of the kupuna is passed down to the children and the ‘ohana take care of the land in the traditional way. [*Id.*] **McGregor**, at p. 24, ll. 11 - 16. [OHA FOFIV.A.10.]

1079. Historically, land was not privately owned; however, the chiefly class provided stewardship over the land, and the land management system reflected the pattern of land use which had evolved through ‘ohana custom and practice. [*Id.*] **McGregor**, at p. 14, ll. 19 - 24. [OHA FOFIV.A.11.]

1080. The chief divided the land under his stewardship among lesser ranking chiefs known as konohiki. *Id.*, at p. 15, ll. 7-8. The lands allocated to the konohiki were called ahupua‘a, whose boundaries coincided with geographic features of a valley. The ahupua‘a ran from the mountains to the ocean and included a source of fresh water from streams or springs. An ahupua‘a afforded the ‘ohana who lived within it most if not all the necessities of life: fresh water, marine foods from the streams and the ocean, low- lying wetlands for taro, and timber and medicinal plants from the forest. **McGregor** Tr. February 22, 1996, at p. 15, ll. 14 - 21. [OHA FOFIV.A.12.]

1081. The manner in which ahupua‘a boundary lines were drawn for land management purposes was based on ‘ohana custom and practice. These lines primarily distinguished the land districts reserved for tribute and were not meant to limit or restrict access of the ‘ohana to the resources needed for survival. **McGregor** Tr. February 22, 1996, at p. 14, l. 22-p. 15, l. 6. [OHA FOFIV.A.13.]

## **11. Stream and Marine Resources**

1082. In ancient days, many taro lo‘i were connected with fish ponds in the coastal waters and the nutrients from those lo‘i and from the adjoining streams were discharged into the ponds providing food for the salt water fish to feed upon. **Eukumitsu**, Ex. M-120, p. 5, par. 17. [OHA FOFIV.D.12.]

1083. "Custom and practice" includes, but is not limited to, the use of streams for drinking water and to provide habitat for the gathering of stream life and marine life. Davianna McGregor, February 22, 1996, p. 44, l. 25; p. 45, ll. 1-7. [WWCA



FOF451]

1084. A variety of traditional and customary practices in Waiāhole, Waikāne, Hakipu‘u, and Kahana are dependent upon adequate streamflow, in addition to taro cultivation. They include the gathering of two species of ‘ōpae, several species of ‘o‘opu, including the ‘o‘opu nākea, hīhīwai, freshwater eel, catfish, and frogs in the stream, as well as aholehole, papio, and mullet that swam up into the stream, and Samoan crabs and limu ‘ele‘ele that were found at the stream mouth. The stream was also used for drinking, bathing, and swimming. Davianna McGregor, April 16, 1996, p. 28, ll. 13-25; p. 30, ll. 10-11; p. 33, ll. 14-24. [WWCA FOF453]

1085. The area from Waiāhole to Kualoa was once rich in marine resources which the inhabitants traditionally and customarily gathered for subsistence, including ‘a‘ama, ala‘eke crab, kuhonu crab, slipper lobster, nehu, uauo, kupe‘e, white crab, weke, palani, kumu, moi, squid, manaua, and wawei‘ole. Davianna McGregor, April 16, 1996, p. 28, ll. 13-25; p. 30, ll. 10-11; p. 33, ll. 14-24. [WWCA FOF454]

1086. Many plants were traditionally and customarily gathered in Waiāhole-Waikāne for medicinal purposes, including shampoo ginger for asthma, uhualoa for sore throats, noni for high blood pressure, noni leaf for shoulder pain, guava shoots for diarrhea, mamake for tea, and ‘awa, and maile, ginger, liko lehua, palapala‘a fern, guava, and ho‘io fern were also gathered. Davianna McGregor, April 16, 1996, p. 32, ll. 15-25. [WWCA FOF455]

1087. The springs in Hakipu‘u were traditionally and customarily used for drinking water, and Hakipu‘u Stream was used to plant taro, bathing, washing clothes, and catching ‘ōpae and ‘o‘opu. Calvin Hoe, April 3, 1996, p. 116, ll. 12-18. [WWCA FOF456]

1088. Waiāhole Stream was traditionally and customarily used for communal bathing, and for catching shrimp, ‘o‘opu, and aholehole fingerlings. Richard Paglinawan, April 10, 1996, p. 279, ll. 19-25; p. 280, ll. 1-10. [WWCA FOF457]

1089. The waters of the stream **[is] are** important to the native Hawaiian people because it allows them to gather resources. One of the resources gathered that are found in the stream are ‘opae. Other resources gathered near the stream include *hoi‘o*. (Kanahele Tr. 5/7/96 at 27, lines 7-14). [KSBE FOF561]

1090. For centuries, native Hawaiians fished and swam in Waiahole Stream and gathered materials there. (C. Hoe Tr. 4/3/96 at 123, lines 7-20; at 122, lines 5-6). [KSBE FOF564]

1091. There used to be sufficient water for fishponds and taro until about 20-30 years ago. Uyemura, Tr., 3/5/96, P136-L1-11. [WIC FOF295]

1092. Until the 1960s, there was an adequate quantity of water remaining in the affected windward streams to adequately protect traditional Hawaiian customs and practices in the Waiahole area. McGregor, Tr., 4/16/96, P61. [WIC FOF285]

1093. The most noticeable decline in water and in natural resources occurred in the early 1960s. After that, the aquatic and terrestrial natural resources declined in amount and size. McGregor, Tr., 4/16/96, P36/L22-25. [WIC FOF286]

1094. Hawaiian people who have a connection to Waiahole believe that the water that was there up through the 1960s was sufficient to provide for their traditional Hawaiian customs and practices. McGregor, Tr., 4/16/96, P61/L19-24. [WIC FOF287]

1095. The reasons cited by Waiahole residents as the reasons for the decrease in water in the early 1960s are the closing off of the auwai going through Mr. Kupau's yard, and the City and County dredging or altering the streams by the bridge. They also thought it was a dry period and that the weather had changed. None of the residents attributed the decrease in water to the Waiahole Ditch diversion, except Mr. Paglinawan. McGregor, Tr., 4/16/96, P69/L10-P70/L25. [WIC FOF288]

1096. There is evidence that more opae was gathered until the early 1960s in the Waiahole-Kahana watersheds. See Badiyo, Tr., 4/3/96, P213/L2-7. [WIC FOF289]

1097. Moreover, the city bulldozing of the stream may have contributed to changes in the stream. (McGregor Tr. 4/16/96 at 57, lines 17-22). Waiahole residents believe that the water in the stream up to the 1960s was sufficient to provide for their traditional Hawaiian customs and practices. (McGregor Tr. 4/16/96 at 61, lines 19-24). [KSBE FOF587]

## **12. Access to Resources**

1098. Although Hakipu'u, Waiahole, Waikane, and Kualoa all represent different *ahupua'as*, C. Hoe has extended family living in each of these *ahupua'as*. Therefore, he believes that he has the right to gather materials in any of these areas. (C. Hoe Tr. 4/3/96 at 157, lines 12-20). [KSBE FOF566]

1099. When native Hawaiians engage in gathering practices, they must take what they get and bring it back to share the resources with other members of the group. However, those people may not necessarily live in the *ahupua'a* from which they

gathered. (McGregor Tr. 4/16/96 at 72, lines 10-16). [KSBE FOF567]

1100. In the past, boundaries did not limit access to resources because *ohana* were allowed to go outside of the *ahupua'a* boundary to gather available resources. (McGregor Tr. 2/22/96 at 30, lines 20-25; at 31, lines 1-4). But, on the contrary, boundaries were actually important with respect to cultivated crops, as well as bird catching, forest products, and fishponds. For example, at Ka Lae, South Point on the Island of Hawaii, a fishing *ko'a* marks a fishing ground which is eight (8) miles from the shoreline, limiting where certain people could fish. Punishment would befall those who went outside their area to fish, gather birds, etc., including possible death to anyone who violated water use. (McGregor Tr. 2/22/96 at 31, lines 5-25; at 34, lines 2-25; at 35, lines 1-9). [KSBE FOF573]

1101. If there was an emergency situation where there were no fish for subsistence, tradition would call for assistance from the neighboring people and would allow them to come in and fish in order to subsist. (McGregor Tr. 2/22/96 at 65, lines 10-23). [KSBE FOF575]

1102. Furthermore, there were instances when other residents from other *ahupua'a* could gather native resources, and not always with permission if it was not available. (McGregor Tr. 2/22/96 at 67, lines 1-12). [KSBE FOF576]

1103. An important and essential resource not available to the *ohana* within their *ahupua'a* would be access to basalt [adzes] which are required [for access to basalt] for adzes. The *ohanas* were allowed to gather these outside of their *ahupua'a*. In Oahu, the adze quarry is in Waiahole. (McGregor Tr. 2/22/96 at 16, lines 24-25; at 17, lines 1-9). [KSBE FOF578]

1104. Moreover, in terms of gathering rights, these rights extend to water, such as someone from outside the *ahupua'a* coming onto another *ahupua'a* to collect water from the stream. (McGregor Tr. 2/22/96 at 75, lines 16-21). [KSBE FOF579]

1105. Although, in most cases, the necessities of life could be gathered within the *ahupua'a*, the forest and ocean areas were commonly accessed by 'ohana from all the *ahupua'a* within a moku, or district. [*Id.*] **McGregor**, at p. 16, ll. 9-14. In practice, however, one did not go into the gathering area of another 'ohana without their permission or unless a member of that 'ohana was present. *Id.*, at p. 27, l. 1 - 3. [OHA FOFIV.A.14.]

1106. 'Ohana lived upon and cultivated lands within their 'ili and enjoyed access to the resources necessary to live. In cases where certain resources were not available to the 'ohana within their *ahupua'a*, they were able to gather outside of their

ahupua'a. For example, rock for adzes was gathered at Mauna Kea on the island of Hawai'i, at Pu'umoiwi on Kaho'olawe, Waiahole on O'ahu, and Kaluakoi on Moloka'i. 'Ohana on Moloka'i fished in the ahupua'a of Kaluakoi on Moloka'i, and 'ohana from Maui went to Kaho'olawe to catch fish and to gather salt to preserve the fish they caught. [*Id.*,] **McGregor**, at ll. 24-25, p. 17, ll. 1-24.. [OHA FOFIV.A.15.]

1107. Native Hawaiians who move to a different ahupua'a which is not connected to their 'ohana have a right to establish a relationship to this new area which would allow them to begin to also have access to resources in this new area for the pursuit of Native Hawaiian traditional and customary subsistence, cultural and religious practices. **McGregor** Tr. February 22, 1996, at p. 81, ll. 20-23. [OHA FOFIV.A.16.]

1108. Only a few of the Hawaiian families have a connection to the lands of Waiahole and Waikane back to the time of the Mahele. McGregor, Tr., 4/16/96, P36/L8-10. [WIC FOF276]

1109. It is a traditional custom and practice of Hawaiians to share resources. McGregor, Tr., 4/16/96, P49-50; Johnson, Tr., 4/11/96, P210, 212. [WIC FOF292]

## **APPENDIX A**

### **Rulings on the Proposed Findings of Fact Submitted by the Parties**

The Commission on Water Resource Management makes the following rulings on the parties' proposed findings of fact. The findings are placed into two categories.

Category A contains findings that are accepted in their entirety, or accepted with minor modifications or corrections which do not substantially alter the meaning of the original findings.

Category B contains findings that are rejected because they may be duplicative, not relevant, taken out of context, contrary (in whole or in part) to the found facts, contrary to law, not material, or contradicted by other evidence.

#### **I. DEPARTMENT OF HAWAIIAN HOME LANDS**

- A. **ACCEPTED** - The following findings of fact were accepted by the Commission in their entirety, or with minor modifications.

None

- B. **REJECTED** - The following findings of fact were rejected by the Commission.

1-2

#### **II. DEPARTMENT OF THE NAVY**

- A. **ACCEPTED**

1-7, 9-12, 14, 17-19, 22-28, 31, 33-34

- B. **REJECTED**

8, 13, 15-16, 20-21, 29, 30, 32

III. HAWAII'S THOUSAND FRIENDS

A. ACCEPTED

24

B. REJECTED

1-23, 25-26

IV. KAMEHAMEHA SCHOOLS/BERNICE PAUAHL BISHOP ESTATE

A. ACCEPTED

1-2, 4-17, 19-28, 32-42, 43-46, 48-67, 70-73, 77-78, 81-89, 91-121, 123-133, 135-194, 196-201, 203-231, 233-242, 244-269, 271, 276-282, 284-291, 293, 295-309, 311-313, 315-321, 323-326, 328-347, 352-355, 357-359, 364-370, 372, 374-375, 377-390, 393-394, 397-405, 407-426, 428-445, 447, 449-473, 475-482, 502, 505-507, 510, 512-516, 518-520, 596-597, 599-600, 602-603, 605-615, 618, 620, 622, 624, 625, 627, 630-633, 635, 637, 639-657, 659-663, 665, 667-672, 675-690, 693-695, 697-701, 703-708, 711-714, 716, 718-726, 728, 731, 735-739, 747, 753, 755-760, 763-764, 768-770, 772, 774-789, 792, 794-796, 799, 801, 803-805, 808-810, 812-813, 815-818, 820, 822-826, 828, 830-834, 836-838, 840, 842-846, 852, 858, 860, 862-863, 865, 867, 868-873, 875-880, 882-883, 884-886, 888-889, 892-905, 907, 909-912, 914, 926-932, 934-935, 938-939, 941-943, 945-954, 956, 958, 961-963, 965-976, 979-980, 982, 985-988, 990-1025, 1027-1035, 1041-1042, 1044, 1047, 1056-1057, 1060-1062, 1065, 1067, 1070, 1072-1076, 1078-1105, 1107-1129, 1131-1132, 1135-1136, 1143, 1164-1165, 1168-1171, 1175, 1177, 1179-1180, 1192, 1203, 1205, 1210-1211, 1214-1215, 1217, 1219, 1223, 1229, 1231, 1234, 1236-1237, 1241-1242, 1251-1252, 1254-1258, 1260, 1264-1266, 1268-1269, 1272-1273, 1275-1280, 1282-1291, 1293-1294, 1296-1315, 1317-1325, 1327-1329, 1332-1333, 1335-1368, 1370-1371, 1374-1384, 1390, 1396, 1398-1402, 1405-1413, 1415, 1418, 1422, 1424, 1426-1428, 1431-1437, 1439-1458, 1466, 1469-1475, 1477-1478, 1481-1482, 1486-1495, 1498, 1501-1513, 1515-1525, 1528-1529, 1532-1564, 1566, 1568-1577, 1589-1594

B. REJECTED

3, 18, 29-31, 47a, 47b, 47c, 68-69, 74-76, 79-80, 90, 122, 134, 195, 202, 232, 243, 270, 272-275, 283, 292, 294, 310, 314-315, 322, 327, 348-351, 356, 360-363, 371, 373, 376, 391-392, 395-396, 406, 427, 437, 446, 448, 462, 467, 474, 483-501, 503-504, 508-509, 511, 517, 521-595, 598, 601, 604, 616-617, 619, 621, 623, 626, 628-629, 634, 636, 638, 658, 664, 666, 673-674, 691-692, 696, 702, 709-710, 715, 717, 727, 729-730, 732-734, 740-746, 748-752, 754, 761-762, 765-767, 771, 773, 790-

791, 793, 797-798, 800, 802, 806-807, 811, 814, 819, 821, 827, 829, 835, 839, 841, 847-851, 853-857, 859, 861, 864, 866, 874, 881, 887, 890-891, 906, 908, 913, 915-925, 933, 936-937, 940, 944, 955, 957, 959-960, 964, 977-978, 981, 983-984, 989, 1026, 1036-1040, 1043, 1045-1046, 1048-1055, 1058-1059, 1063-1064, 1066, 1068-1069, 1071, 1077, 1106, 1130, 1133-1134, 1137-1142, 1144-1163, 1166-1167, 1172-1174, 1176, 1178, 1181-1191, 1193-1202, 1204, 1206-1209, 1212-1213, 1216, 1218, 1220-1222, 1224-1228, 1230, 1232-1233, 1235, 1238-1240, 1243-1250, 1253, 1259, 1261-1263, 1267, 1270-1271, 1274, 1281, 1292, 1295, 1316, 1326, 1330-1331, 1334, 1369, 1372-1373, 1385-1389, 1391-1395, 1397, 1403-1404, 1414, 1416-1417, 1419-1421, 1423, 1425, 1429-1430, 1438, 1459-1465, 1467-1468, 1476, 1479-1480, 1483-1485, 1496-1497, 1499-1500, 1514, 1526-1527, 1530-1531, 1565, 1567, 1578-1588, 1595-1612

V. NIHONKALLEASE COMPANY

A. ACCEPTED

1-14, 16-19, 21-22, 25-27, 30-31

B. REJECTED

15, 20, 23-24, 28-29

VI. OFFICE OF HAWAIIAN AFFAIRS

A. ACCEPTED

I.A.4, I.A.6, I.A.9, I.B.2-3, I.B.5-8, II.A.1, II.A.7, II.A.10-13, II.B.1-4, III.A.1-6, III.A.8-11, III.A.13, IV.D.20-22, IV.D.25-30, IV.D.32-41, IV.E.1-2, IV.E.4-7, IV.E.9-11, IV.E.13, IV.E.17, IV.E.19, IV.F.2-11, IV.G.4, IV.G.6, IV.G.8, IV.G.14-16, IV.G.19-20, IV.G.22-23, IV.H.2-11, IV.H.13-14, IV.H.17-20, IV.H.23-25, IV.H.26-28, IV.H.30-32, IV.H.34-36, IV.H.38, IV.H.42-47

B. REJECTED

I.A.1-3, I.A.5, I.A.7-8, I.A.10-11, I.B.1, I.B.4, I.B.9, II.A.2-6, II.A.8-9, II.A.14, II.B.5, III.A.7, III.A.12, IV.A.1-17, IV.B.1-5, IV.C.1-2, IV.D.1-19, IV.D.23-24, IV.D.31, IV.E.3, IV.E.8, IV.E.12, IV.E.14-16, IV.E.18, IV.F.1, IV.F.12, IV.G.1-3, IV.G.5, IV.G.7, IV.G.9-13, IV.G.17-18, IV.G.21, IV.H.1, IV.H.12, IV.H.15-16, IV.H.21-22, IV.H.29, IV.H.33, IV.H.37, IV.H.39-41, IV.H.48-49, IV.H.50-51

VII. PUU MAKAKILO, INC.

A. ACCEPTED

1-10, 12-21, 23-24, 26-34, 37, 40-58, 62-68, 70, 74-83

B. REJECTED

11, 22, 25, 35-36, 38-39, 59-61, 69, 71-73, 84

VIII. ROYAL OAHU RESORT

A. ACCEPTED

1, 2, 3, 4-19, 21-22, 24-26, 30-38, 40-41, 44-45, 50-51, 53-54, 56, 60-61

C. REJECTED

20, 23, 27-29, 39, 42-43, 46-49, 52, 55, 57-59, 62

IX. WAI AHOLE IRRIGATION COMPANY

A. ACCEPTED

4, 13, 16, 19-23, 25, 27-32, 35-46, 47a, 47b, 47c, 47d, 47e, 47f, 47g, 48-69, 71, 75-76, 79-104, 106, 108-123, 125, 127-129, 133-136, 139, 142, 145, 147-151, 153-155, 157-160, 162-164, 168-175, 181, 185, 187-192, 194-197, 204, 206, 208-213, 218-220, 223-224, 228, 230-231, 233-240, 242, 248, 250, 253-267, 270, 275, 302-313, 315-333, 335, 337, 339-344, 354-355, 358, 361-364, 366-379, 381-392, 394-406, 409-416, 418-428

B. REJECTED

1-3, 5-12, 14-15, 17-18, 24, 26, 33-34, 70, 72-74, 77-78, 105, 107, 124, 126, 130-132, 137-138, 140-141, 143-144, 146, 152, 156, 161, 165-167, 176-179, 180, 182-184, 186, 193, 198-203, 205, 207, 214-217, 221-222, 225-227, 229, 232, 241, 243-247, 249, 251-252, 268-269, 271-301, 314, 334, 336, 338, 345-353, 356-357, 359-360, 365, 380, 393, 407-408, 417



X. WAIAHOLE-WAIKANE COMMUNITY ASSOCIATION

A. ACCEPTED

2, 4-8, 10-16, 18, 20-23, 32, 35-42, 45, 47-55, 57-66, 68-71, 75-83, 85-89, 91-92, 94-97, 99-100, 103-105, 108-111, 113-127, 135-139, 141-143, 146-150, 153-154, 159-165, 167-180, 185-187, 189, 193-194, 197, 199, 201, 203-204, 212-213, 220, 222, 227, 229, 231-233, 236-237, 239-241, 244, 247-248, 261-265, 271-276, 278-280, 285, 290-293, 300, 302-305, 307-311, 313-314, 316, 318-320, 322-323, 332-333, 336, 339-340, 343, 345-351, 353, 355, 357-360, 362, 365, 369-370, 374, 375, 377-381, 384-386, 389-392, 402, 405-407, 421-422, 429, 435, 442, 445, 449, 450, 453-457, 459-463, 466-469

B. REJECTED

1, 3, 9, 17, 19, 24-25, 26-31, 33-34, 43-44, 46, 56, 67, 72-74, 84, 90, 93, 98, 101-102, 106-107, 112, 128-134, 140, 144-145, 151-152, 155-158, 166, 181-184, 188, 190-192, 195-196, 198, 200, 202, 205-211, 214-219, 221, 223-226, 228, 230, 232, 234-235, 238, 242-243, 245-246, 249-260, 266-270, 277, 281-284, 286-289, 294-299, 301, 306, 312, 315, 317, 321, 324-331, 334-335, 337-338, 341-342, 344, 352, 354, 356, 361, 363-364, 366-368, 371-373, 376, 382-383, 387-388, 393-401, 403-404, 408-420, 423-428, 430-434, 436-441, 443-444, 446-448, 451-452, 458, 464-465, 470

XI. WEST BEACH ESTATES

A. ACCEPTED

1, 2, 3, 4-10, 11(page 3), 11(page 4), 12-15, 16(page 4), 16(page 5), 17-18, 20-28

B. REJECTED

## CONCLUSIONS OF LAW

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## V. CONCLUSIONS OF LAW

Pursuant to the amendment of the Hawaii State Constitution in 1978 (Haw. Const. art. XI, § 7), the Hawaii legislature enacted the Hawaii Water Code (Haw. Rev. Stat. chap. 174C) in 1987. The Waiahole contested case presents a situation in which the Commission must integrate provisions within the Water Code addressing water use permits and stream protection as well as previously established Hawaii water law.

Consequently, the Commission must review at some length both the text of the Water Code and the interrelated structure of Hawaii's water law in order to explain the integration of factors underlying this decision. This integrative and defining process is not a static one, but one that is and will be ongoing. As the Hawaii Supreme Court explained in 1982, Hawaii is just beginning to define the parameters of the public interest in Hawaii's waters.

The McBryde opinion was only the beginning of a necessary definition of the parameters of the State's authority and interests in Hawaii's waters. These parameters, we believe, should be developed on a case by case basis or by the legislature as the particular interests of the public are raised and defined. However, the [McBryde] opinion properly clarified the nature of respective rights to water, that is, it made clear that underlying every private diversion and application there is, as there always has been, a superior public interest in this natural bounty.

Robinson v. Ariyoshi, 65 Haw. 641, 677, 658 P.2d 287, (1982)  
(six certified questions).

### A. Legal Framework

Water decisions in Hawaii are governed by the State Constitution (Haw. Const. art. XI, § 7), the Hawaii Water Code (Haw. Rev. Stat. chapter 174C), the common law as determined by the Hawaii Supreme Court, the administrative rules of the Commission (Hawaii Administrative Rules, chapters 13-167 through 13-171), the history of Hawaiian usage (Haw. Rev. Stat. § 1-1), and the hydrological conditions present in each situation.

Hawaii's water law establishes a framework for organizing the multiple values embedded in the Constitution, the Water Code, and the common law. These laws impose considerations which, given the hydrological conditions and history of the Waiahole ditch system, lead to specific and fact intensive conclusions.

This case involves the interrelationship between ground and surface water in the Koolau mountain range, a 26 mile long trans-Koolau tunnel and ditch collection and delivery system, the needs of leeward Oahu agricultural and other enterprises, the State's public trust responsibilities for streams and for Kaneohe Bay, and the claims of Hawaiian gathering rights. This decision integrates Hawaii's water law with the characteristics of not a single parcel of land, but of an entire region.

We begin that "necessary definition of the parameters" of Hawaii's water law with the Hawaii State Constitution.

## 1. State Constitution

On November 7, 1978 the people of Hawaii amended the Hawaii State Constitution by adding article XI, § 7 to provide for a single water resources agency that would comprehensively "protect, control and regulate" all the islands' fresh water resources:

The State has an obligation to protect, control and regulate the use of Hawaii's water resources for the benefit of its people.<sup>1</sup>

2. The legislature shall provide for a water resources agency which, as provided by law, shall set overall water conservation, quality and use policies; define beneficial and reasonable uses; protect ground and surface water resources, watershed and natural stream environments; establish criteria for water use priorities while assuring appurtenant rights and existing correlative and riparian uses and establish procedures for regulating all uses of Hawaii's water resources.

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<sup>1</sup>This was originally stated as "all waters shall be held by the State as a public trust for the people of Hawaii." Although it was amended to avoid any implication of ownership, the intent was the same: to convey the duty of the State to act in a fiduciary role with regard to the use of the water and the trustee relationship between the State and its people.

The Standing Committee Report states:

Your Committee has proposed the above amendment to clarify the intent behind the use of the term "public trust." Some confusion has been generated by the term because "trust" implies ownership. However, it was never intended that the proposal confront the question of ownership of water resources because that is more appropriately a matter for the courts.

The question of ownership of the freshwater resources is irrelevant to the ability of the State to exercise its police power to protect, control and regulate Hawaii's freshwater resources for the health and welfare of Hawaii's people. Because of the evergrowing population, the need to maintain present agricultural uses and develop some new ones and the diminishing freshwater supply, it is extremely important that the State act with a sense of fiduciary responsibility with regard to the use of water. Therefore, "public trust" was used to describe the nature of the relationship between the State and its people and the duty of the State to actively and affirmatively protect, control and regulate water resources, including the development, use and allocation of water.

The public trust theory holds that the public has certain important rights in water resources, including land underlying navigable water and fisheries. These resources are to be held in trust for the use and enjoyment of the people. The Hawaii supreme court has already imposed the public trust on navigable waters and the lands under them in the case of Bishop v. Mahiko, 35 Haw. 608 (1940). However, to avoid confusion and possible litigation, your Committee has substituted language which your Committee believes fully conveys the theory of "public trust."

Proceedings of the Constitutional Convention of Hawaii of 1978, Vol. 1 Journal and Documents, page 1026.

## 2. Hawaii Water Code: Haw. Rev. Stat. chap. 174C

Pursuant to the 1978 amendment to the State Constitution (art. XI, § 7 (1978)), Hawaii's legislature adopted the Hawaii Water Code ("Water Code") which became effective July 1, 1987. Haw. Rev. Stat. chapter 174C. The Water Code begins with broad declarations of policy that Hawaii's waters are held for the benefit of the citizens of the State, that all waters must be protected, that there be a program of comprehensive water resource planning, that maximum beneficial use of the waters occur within the context of protecting traditional and customary Hawaiian rights and of maintaining the proper ecological balance, and that water quality be protected and improved:

Declaration of policy. (a) It is recognized that the waters of the State are held for the benefit of the citizens of the State. It is declared that the people of the State are beneficiaries and have a right to have the waters protected for their use.

(b) There is a need for a program of comprehensive water resources planning to address the problems of supply and conservation of water. The state water use and protection plan, with such future amendments, supplements, and additions as may be necessary, is accepted as the guide for developing and implementing this policy.

(c) The state water code shall be liberally interpreted to obtain maximum beneficial use of the waters of the State for purposes such as domestic uses, aquaculture uses, irrigation and other agricultural uses, power development, and commercial and industrial uses. However, adequate provision shall be made for the protection of traditional and customary Hawaiian rights, the protection and pro-creation of fish and wildlife, the maintenance of proper ecological balance and scenic beauty, and the preservation and enhancement of waters of the State for municipal uses, public recreation, public water supply, agriculture, and navigation. Such objectives are declared to be in the public interest.

(d) The state water code shall be liberally interpreted to protect and improve the quality of waters of the State and to provide that no substance be discharged into such waters without first receiving the necessary treatment or other corrective action. The people of Hawaii have a substantial interest in the prevention, abatement, and control of both new and existing water pollution and in the maintenance of high standards of water quality.

(e) The state water code shall be liberally interpreted and applied in a manner which conforms with intentions and plans of the counties in terms of land use planning. [L 1987, c 45, pt of §2]

Haw. Rev. Stat. § 174C-2.

The Water Code establishes a state Commission on Water Resource Management (Commission) "which shall have exclusive jurisdiction and final authority in all matters relating to implementation and administration of the state water code. . . ." (Haw. Rev. Stat. § 174C-7) and which shall comprehensively manage "all waters of the State." Haw. Rev. Stat. § 174C-4(a). The Water Code provides for the investigation, protection, and regulation of ground and surface waters (Haw. Rev. Stat. § 174C-5, Part IV, and -71), wells (Haw. Rev. Stat. ch. 174C, Part VII and VIII),

instream flows (Haw. Rev. Stat. § 174C-71), stream channels (Haw. Rev. Stat. §§ 174C-91 through -95), and for the allocation of ground and surface waters in the context of integrated land use planning (Haw. Rev. Stat. § 174C-31).

The Water Code provides a variety of mechanisms for resolving disputes (Haw. Rev. Stat. § 174C-10), protecting the rights of Hawaiian home lands (Haw. Rev. Stat. § 174C-101), assuring gathering rights (*id.*), and maintaining the proper ecological balance while seeking to obtain the maximum beneficial use of waters of the State for domestic, agricultural, and commercial uses (Haw. Rev. Stat. chap. 174C, *infra.*).

The Water Code establishes procedures, including notice to affected persons and appropriate forums, to address all water related issues. The Commission is directed to consider designation water management areas where one or more of several threshold threats to the resource are found (Haw. Rev. Stat. §§ 174C-41 to -63) and then issue water use permits. Where there are competing applications for water use and the quantity

is inadequate for both or all, . . . the commission shall first, seek to allocate water in such a manner as to accommodate both applications if possible; second, if mutual sharing is not possible, then the commission shall approve that application which best serves the public interest.

Haw. Rev. Stat. § 174C-54.

Especially relevant to this case, the Commission is mandated to "establish and administer a statewide instream use protection program" in which the "present and potential instream values are weighed with the present and potential offstream uses, including the economic impact of restricting such uses." Haw. Rev. Stat. § 174C-71(1)(E) and (2)(D). The Commission is charged to "[e]stablish a program to protect, enhance, and reestablish, where practicable, beneficial instream uses of water." Haw. Rev. Stat. § 174C-71(4).

Thus, in addition to its conflict resolution and quasi-judicial functions to resolve citizen complaints (Haw. Rev. Stat. § 174C-13), disputes (Haw. Rev. Stat. § 174C-10), and competing claims (Haw. Rev. Stat. §§ 174C-50(h) and -54), the Commission is given broad powers to act prospectively to protect streams by seeking or using alternative water sources. The Water Code provides that

[i]n order to avoid or minimize the impact on existing uses of preserving, enhancing or restoring instream values, the commission shall consider physical solutions, including water exchanges, modifications of project operations, changes in points of diversion, changes in time and rate of diversion, use of water from alternate sources, or any other solution[.]

Haw. Rev. Stat. § 174C-71(1)(E).

These powers allow the Commission to engage in factually intense investigations and to find or propose solutions in a timely manner that may obviate or postpone the need for protracted, expensive, and difficult judicial determinations. The need for a quasi-judicial administrative body

capable of resolving water disputes expeditiously, inexpensively and with the ability to create new solutions prospectively was one of the central factors in the adoption of the Water Code. See Conf. Com. Rep. No. 118 (April 27, 1987) to Act 45, SLH 1987.

The Commission also promulgated administrative rules to carry out the Water Code. Hawaii Administrative Rules (HAR) Title 13, chapters 167-171.<sup>2</sup>

### 3. Hawaii's Common Law

Except as expressly provided in the State Constitution or the Hawaii Water Code, the common law as determined by the Hawaii Supreme Court defines the substantive nature of rights to use water in Hawaii.

Surface water use rights are governed by the Hawaii Supreme Court's most recent decisions in *Reppun v. Board of Water Supply*, 65 Haw. 531, 656 P.2d 57 (1982), cert. denied 471 U.S. 1014 (1985), *Robinson v. Ariyoshi*, 65 Haw. 641, 658 P.2d 287 (1982) (six certified questions), and *McBryde v. Robinson*, 54 Haw. 174, 504 P.2d 1330, aff'd on rehearing, 55 Haw. 260, 517 P.2d 26 (1973), cert. denied 417 U.S. 962, appeal dismissed 917 U.S. 962 (1974).

Artesian and ground-water use rights are governed by the Hawaii Supreme Court's decision in *City Mill Co. v. Honolulu Sewer and Water Comm.*, 30 Haw. 912 (1929).

#### B. Public Trust and Public Trust Doctrine

Hawaii's Constitution specifically recognizes that Hawaii's natural resources are held in a public trust.

Section 1. For the benefit of the present and future generations, the State and its political subdivisions shall conserve and protect Hawaii's natural beauty and all natural resources, including land, water, air, minerals and energy sources, and shall promote the development and utilization of these resources in a manner consistent with their conservation and in furtherance of the self sufficiency of the State.

All public natural resources are held in trust by the State for the benefit of the people.

Haw. Const. art. XI, § 1.

Moreover, the Hawaii Supreme Court has held that Hawaii's fresh water resources reserved by the King at the Mahele from fee simple title are held in public trust and that they are subject to

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<sup>2</sup> Rules of Practice and Procedure (HAR chapter 13-167); Declarations of Water Use, Wells, and Stream Diversion Works (HAR chapter 13-168); Protection of Instream Flows (HAR chapter 13-169), Hawaii Water Plan (HAR chapter 13-170); and Designation and Regulation of Water Management Areas (HAR chapter 13-171).



review and protection under the judicially recognized, but distinct, public trust doctrine. *Robinson v. Ariyoshi*, 65 Haw. 641, 673-677 (1982) (" . . . by this [the King's] reservation, a public trust was imposed upon all the waters of the kingdom.") (six certified questions); *McBryde v. Robinson*, 54 Haw. at 187; *Kina v. Oahu Railway and Land Co.* 11 Haw. 717 (1898) (public trust doctrine made applicable to Hawaii).

At the time of the Mahele, the government "did not supplant the konohikis . . . in the sense that the State is now free to do as it pleases with the waters of our lands." *Robinson*, 65 Haw. at 673. Rather, it is the government's duty to reassure the continued existence and beneficial application of water resources for the common good.

In *McBryde*, *supra*, we indeed held that at the time of the introduction of fee simple ownership to these islands the king reserved ownership of all surface waters. 54 Haw. at 187, 504 P.2d at 1339. But we believe by this reservation, a public trust was imposed upon all the waters of the kingdom. That is, we find that the public interest in the waters of the kingdom was understood to necessitate a retention of authority and the imposition of a concomitant duty to maintain the purity and flow of our waters for future generations and to assure that the waters of our land are put to reasonable and beneficial uses. This is not ownership in the corporeal sense where the State may do with the property as it pleases; rather, we comprehend the nature of the State's ownership as a retention of such authority to reassure the continued existence and beneficial application of the resource for the common good.<sup>3</sup>

The nature of this ownership is thus akin to the title held by all states in navigable waterways which was recognized by the United States Supreme Court in Illinois *Central Railroad v. Illinois*, 146 U.S. 387, 452 (1892).

. . . The extent of the state's trust obligation over all waters of course would not be identical to that which applies to navigable waterways. That such powers and obligations exist, however, is not open to question.

*Robinson*, 65 Haw. at 674-676.

The Hawaii Supreme Court clarified in *Robinson* that it is the State's sovereign power and duty to exercise continued supervision over Hawaii's fresh water public trust resources.

The reassertion of dormant public interests in the diversion and application of Hawaii's waters has become essential with the increasing scarcity of the resource and recognition of the public's interests in the utilization and flow of those waters. . . . For while there indeed exist relative usufructuary rights among landowners, these rights can no longer be treated as

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<sup>3</sup> This authority and duty is separate from and "much more than a restatement of police powers." *Id.* at 674, n.31.

though they are absolute and exclusive interests in the waters of our state. . . .[U]nderlying every private diversion and application there is, as there always has been, a superior public interest in this natural bounty.

Robinson, 65 Haw. at 676-677; See National Audubon Society. 658 P.2d at 727.

The public trust doctrine is a court created doctrine which arose from judicial review of executive or legislative management of the public's natural resources, particularly tidal or navigable waters, and now fresh waters. Robinson, 65 Haw. 674-677; King v. Oahu Railway, 11 Haw. 717 (1898); National Audubon Society v. Superior Court of Alpine County, 658 P.2d 709, 33 Cal.3d 419 (1983) (National Audubon or "Mono Lake") (by contrast, the King's reservation at the Mahele, article XI, §§ 1 and 7 of the Hawaii Constitution, the Hawaii Admission Act, § 5(f), and Haw. Rev. Stat. § 7-1 are affirmatively created statutory public trusts). The public trust doctrine was first recognized by the Hawaii Supreme Court in 1898 in King v. Oahu Railway, 11 Haw. 717, and later in Robinson v. Ariyoshi, 65 Haw. at 674-677 and McBryde v. Robinson, 54 Haw at 187. It followed the United States Supreme Court's incorporation of the doctrine in Illinois Central Railroad v. Illinois, 146 U.S. 387, 452 (1892).

The Constitutional mandate and these judicial decisions culminated in the adoption of the State Water Code in 1987 by the State Legislature. The declaration of policy in the State Water Code provides:

It is recognized that the waters of the State are held for the benefit of the citizens of the State. It is declared that the people of the State are beneficiaries and have a right to have the waters protected for their use.

Haw. Rev. Stat. §174C-2(a)

#### 1. Purpose

The purpose of the public trust has evolved with the changing public values and uses of water and navigable water ways. Originally applied to navigation, commerce, and fisheries, the public trust doctrine now includes public values related to recreation, scenic value, the scientific study of the natural ecology, and environmental protection. Robinson, 65 Haw. at 674-677; National Audubon, 658 P.2d at 719.

#### 2. Scope

The Hawaii Supreme Court has expressly extended the application of the public trust doctrine from navigable water ways to all of Hawaii's fresh waters. Robinson, 65 Haw. at 674-675; see National Audubon, 658 P.2d at 719-721.

The ground and surface water in the Koolau mountains collected by the Waiahole Ditch system are physically interrelated. Reppun v. BWS, 65 Haw. 531, 554-556 & n.16 (1982). Thus, the petitions to amend the interim instream flow standards involve, with minor exceptions, the same water which is the subject of Waiahole Irrigation Co.'s June 3, 1993 joint water use permit

application (amended June 14, 1994).

Where ground and surface water are physically interrelated into a single system, then the public trust aspects of surface water apply to that ground-water source.

This acknowledgement of the unity of the hydrological cycle has been characterized as the "modern scientific approach." [citations omitted] We agree that the law must recognize that "all waters are part of a natural watercourse, whether visible or not, constituting a part of the whole body of moving water." City of Colorado Springs v. Bender, 148 Colo. 458, 461, 366 P.2d 552 (1961) We therefore hold that where ground and surface water can be demonstrated to be physically related parts of a single system, established surface water rights may be protected against diversions that injure those rights, whether the diversion involves surface water or ground water.<sup>4</sup>

Reppun v. BWS, 65 Haw. 531, 554-556 & n.16 (1982).

### 3. Duties and Powers of the State

The State has a duty to protect, control and regulate water resources and must act with a sense of fiduciary responsibility with regard to the use of water. The State Water Code constitutes a method to achieve this public trust responsibility.

There is public interest in the maximum beneficial use of water, the protection of traditional and customary Hawaiian rights, the protection and procreation of fish and wildlife, and other public interest objectives provided for in the State Water Code.<sup>5</sup> Balancing these interests, which are often competing, is the responsibility of the State. However, the balancing of these interests will not necessarily fulfill the State's public trust responsibilities. Although determination of the public interest may sometimes meet the public trust responsibilities of the State, there is a distinct and separate duty to "assure the continued existence and beneficial application of the resource, for the common good." Robinson, 65 Haw. at 674.

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<sup>4</sup> The Hawaii Supreme Court has held that a public trust was imposed upon all the waters of Hawaii irrespective of whether the ground-surface water interaction exists. Robinson, 65 Haw. at 674.

<sup>5</sup>HRS 174C-2(c) provides:

The state water code shall be liberally interpreted to obtain maximum beneficial use of the waters of the State for purposes such as domestic uses, aquaculture uses, irrigation and other agricultural uses, power development, and commercial and industrial uses. However, adequate provision shall be made for the protection of traditional and customary Hawaiian rights, the protection and procreation of fish and wildlife, the maintenance of proper ecological balance and scenic beauty, and the preservation and enhancement of waters of the State for municipal uses, public recreation, public water supply, agriculture, and navigation. Such objectives are declared to be in the public interest.

#### 4. Application

The Hawaii Supreme Court has concluded that fresh water is not just a commodity to be taken and used without regard to the effects on the streams or upon other people. In Robinson, the Hawaii Supreme Court held that the public trust doctrine is a necessary correction to some pre-McBryde arguments that

there existed no apparent common law restraint upon the right of private parties to drain rivers dry for whatever purposes they saw fit. Such a system may have been deemed appropriate and beneficial in other historical contexts. But this is no longer the case.

Robinson, 65 Haw. at 676.

It is possible that the public trust doctrine, developed and applied to the full extent of its principles and rules could lead to the conclusion that stream water might never be diverted for offstream uses. This reading, however, would be inconsistent with the history of offstream uses permitted to property owners adjacent to streams (riparian rights) and taro lands (appurtenant rights) which have long been recognized by Hawaii's courts and constitution and which are authorized under the Water Code. Reppun, 65 Haw. 531; Haw. Rev. Stat. chap. 174C, Parts IV, VI, VIII, and IX.

It is recognized that instream public trust values are often diametrically opposed to the need for offstream uses, but that the abandonment of either set of values would result in a seriously imbalanced situation.<sup>6</sup>

By the adoption of the Water Code itself, the legislature has authorized the Commission to issue water use permits for offstream uses. Haw. Rev. Stat. 174C, Part IV. Thus, the public trust doctrine does not of itself require that all diverted streams be restored to their pre-diversion state nor does it mean that all new off-stream use applications must be denied. The particular level of protection may vary with circumstances and from time to time. If the Commission issues a water use permit for an offstream use, the Commission has a continuing responsibility to supervise that use

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<sup>6</sup>The California Supreme Court in National Audubon opined:

In our opinion, both the public trust doctrine and the water rights system embody important precepts which make the law more responsive to the diverse needs and interests involved in the planning and allocation of water resources. To embrace one system of thought and reject the other would lead to an unbalanced structure, one which would either decry as a breach of trust appropriations essential to the economic development of this state, or deny any duty to protect or even consider the values promoted by the public trust. Therefore, [the Court] seek[s] an accommodation which will make use of the pertinent principles of both the public trust doctrine and the . . . water rights system, and draw . . . upon the history of the public trust and water rights system, the body of judicial precedent, and the views of expert commentators.

National Audubon Society, 658 P.2d at 727.

under the permit and under the public trust doctrine. The state accordingly has the power to reconsider allocation decisions even though those decisions were made after due consideration of their effect on the public trust.<sup>7</sup> Further, where offstream uses will be considered, the public trust doctrine requires a heightened level of scrutiny, broad based decision making, comprehensive water planning, and reasonable efforts to mitigate or undo harm.<sup>8</sup>

### C. Burden of Proof

Every applicant or petitioner has the burden of both coming forward and of demonstrating how the application or petition meets the requirements of law. For water use permits, see Haw. Rev. Stat. § 174C-49(a) ("To obtain a permit pursuant to this part, the applicant shall establish that the proposed use of water. . .") and § 174C-50(a) ("All existing uses . . . may be continued . . . only with a permit . . ."). For instream petitions, see Haw. Rev. Stat. §174C-71(2)(c) ("A petition . . . shall set forth data and information . . .").

The standards of proof are provided in the Water Code. The water use permit criteria are provided in Haw. Rev. Stat. §§ 174C-49(a) and 50(b). The Interim Instream Flow Standard Petition criteria are provided in Haw. Rev. Stat. §174C-71(2).

### D. Interim Instream Flow Standards

On December 7, 1993 three windward Oahu organizations (Kahaluu Neighborhood Board No. 29, Waiahole-Waikane Community Association, and Hakipuu Ohana) and later the office of Hawaiian Affairs filed petitions to amend the interim instream flow standard for windward streams from Waiahole, Waikane, and Kahana affected by the Waiahole Ditch system. As pointed out above, the interrelated nature of ground and surface water on the windward side of the Koolau mountains means that the petitions to amend instream flows involve the same Waiahole Ditch water which was the

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<sup>7</sup> The State Water Code anticipated this situation by providing for reallocation if there are competing interests:

**Existing uses.** Two or more existing uses of water are deemed to be competing when they draw water from the same hydrologically controllable area and the aggregate quantity of water consumed by the users exceeds the appropriate sustainable yield or instream flow standards established pursuant to law for the area. If applications are made to continue existing uses which are competing and the uses otherwise meet the requirements of subsection (b), the commission shall hold a hearing to determine the quantity of water that may be consumed and the conditions to be imposed on each existing use. Haw. Rev. State. § 174C-50(h).

**New uses.** If two or more applications which otherwise comply with section 174C-49 are pending for a quantity of water that is inadequate for both or all, or which for any other reason are in conflict, the commission shall first, seek to allocate water in such a manner as to accommodate both applications if possible; second, if mutual sharing is not possible, then the commission shall approve that application which best serves the public interest. Haw. Rev. Stat. § 174C-54.

<sup>8</sup> Johnson, Public Trust Protection for Stream Flows and Lake Levels, 14 U. C. Davis L. Rev. 233, 241-244, 252-255 (No. 2, Winter, 1980).

subject of Waiahole Irrigation Co.'s June 3, 1993 joint water use permit application (amended June 14, 1994) to use this water across the Koolau Mountains in leeward Oahu. Reppun v. BWS, 65 Haw. 531, 554-556 (1982).

Hawaii's Constitution requires the State to "protect ground and surface water resources, watersheds, and natural stream environments. . . ." Haw. Const. art. XI, § 7.

Pursuant to this mandate, the Hawaii Water Code directed the Commission to "establish and administer a statewide instream use protection program" which considers both present and potential instream values and present and potential offstream uses. Haw. Rev. Stat. § 174C-71. The Water Code also directs the Commission to prepare a broad based "water resource protection plan" which is used to inform and guide the management of the resource. Haw. Rev. Stat. § 174C-31 (a) & (c). In managing the resource, § 174C-31 further provides:

(g) The commission shall condition permits under part IV of this chapter in such a manner as to protect instream flows and maintain sustainable yields of ground water established under this section.

(h) The commission shall give careful consideration to the requirements of public recreation, the protection of the environment, and the procreation of fish and wildlife. The commission may prohibit or restrict other future uses on certain designated streams which may be inconsistent with these objectives.

(i) The commission may designate certain uses in connection with a particular source of supply, which because of the nature of the activity or the amount of water required, would constitute an undesirable use for which the commission may deny a permit under the provisions of part IV. [emphasis added]

Haw. Rev. Stat. § 174C-31.

Therefore, it is incumbent upon the Commission to examine what effect stream flow levels have on the values, enumerated in Haw. Rev. Stat. § 174C-31(h), to be protected by the streamflow.

Under the State Constitution and the public trust doctrine, the State's first duty is to protect the fresh water resources (surface and ground) which are part of the public trust res. Haw. Const. art. XI, § 7; Robinson v. Ariyoshi, 65 Haw. at 674. The duty to protect public water resources is a categorical imperative and the precondition to all subsequent considerations, for without such underlying protection the natural environment could, at some point, be irrevocably harmed and the "duty to maintain the purity and flow of our waters for future generations and to assure that the waters of our land are put to reasonable and beneficial uses" could be endangered. Id. However, the duty to protect does not necessarily or in every case mean that all offstream uses must cease, that no new offstream uses may be made, or that all waters must be returned to a state of nature before even the first Hawaiians arrived in these islands and diverted stream water to grow taro. The particular level of protection may vary with circumstances and from time to time; but the primary duty itself remains.

Because only windward Oahu ground water was designated for management in 1992 (the petition for surface water designation was denied without prejudice), no windward surface water use permit applications are or could have been filed here. However, pursuant to the requirements of the Hawaii Supreme Court, where ground and surface water interact as here, ground-water withdrawals or out-of-watershed transfers must not diminish stream flows sufficiently to interfere with the instream flow standard or downstream surface water use rights. Such interference may be prohibited. Reppun v. BWS, 65 Haw. at 564-565. Accordingly, a landowner's correlative ground-water use may be limited depending upon its impact on the streams or downstream rights. Id.

1. Protection of Instream Uses: Haw. Rev. Stat. § 174C-71

The Water Code directs the Commission to "establish a statewide instream use protection program" through the adoption of interim and later permanent instream flow standards, stream channel alteration permits, and an "instream flow program to protect, enhance, and reestablish, where practicable, beneficial instream uses of water." Haw. Rev. Stat. § 174C-71.

An "instream flow standard" is that

quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of year to protect fishery, wildlife, recreational, aesthetic, scenic and other beneficial instream uses. [emphasis added]

Haw. Rev. Stat. § 174C-2.

An "interim instream flow standard" is simply a

temporary instream flow standard of immediate applicability, adopted by the commission without the necessity of a public hearing, and terminating upon the establishment of an instream flow standard.

Id.

An "instream use" is defined to mean those

beneficial uses of stream water for significant purposes which are located in the stream and which are achieved by leaving water in the stream. Instream uses include, but not limited to:

- (1) Maintenance of fish and wildlife habitat;
- (2) Outdoor recreational activities;
- (3) Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation;
- (4) Aesthetic values such as waterfalls and scenic waterways;
- (5) Navigation;
- (6) Instream hydropower generation.
- (7) Maintenance of water quality;

- (8) The conveyance of irrigation and domestic water supplies to downstream points of diversion; and
- (9) The protection of traditional and customary Hawaiian rights [emphasis added]

Id.

Neither navigation nor hydropower are at issue here. The conveyance of irrigation water supplies to downstream points of diversion applies to downstream riparian or appurtenant claims, but not to water transported by the Waiahole Ditch itself.

The Water Code (Part VI) creates an instream flow protection program. Haw. Rev. Stat. § 174C-71. The Code establishes an overall framework within which the Commission must set instream flow standards by weighing the importance of present or potential instream values with present or potential offstream uses, including the economic impact of restriction of such uses.

The methodology in § 174C-71 to determine an instream flow standard may be roughly summarized as follows. First, the Commission must investigate the ecology of the stream including the stream flows. Second, with this information, the Commission determines how different water flows affect different levels of protection (including partial restoration, if needed) that should be afforded the streams at issue by evaluating the water flows needed for instream values. Third, the Commission must determine the present and potential offstream uses, as well as the economic impact of restricting such uses. Fourth and finally, the Commission must weigh and decide what water, if any, may be removed from its source and effectively diverted from windward streams for offstream use both within the watershed and, as sought here, outside the watershed.<sup>9</sup>

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<sup>9</sup> Haw. Rev. Stat., Part VI, "Instream Uses of Water" § 174C-71 Protection of Instream Uses. The commission shall establish and administer a statewide instream use protection program. In carrying out this part, the commission shall cooperate with the United States government or any of its agencies, other state agencies, and the county governments and any of their agencies. In the performance of its duties the commission shall:

- (1) Establish instream flow standards on a stream-by-stream basis whenever necessary to protect the public interest in waters of the State;
  - (A) The commission, on its own motion, may determine that the public interest in the waters of the State requires the establishment of an instream flow standard for streams;
  - (B) In acting upon the establishment of instream flow standards, the commission shall set forth in writing its conclusion that the public interest does or does not require, as is appropriate, an instream flow standard to be set for the stream, the reasons therefore, and the findings supporting the reasons;
  - (C) Each instream flow standard shall describe the flows necessary to protect the public interest in the particular stream. Flows shall be expressed in terms of variable flows of water necessary to protect adequately fishery, wildlife, recreational, aesthetic, scenic, or other beneficial instream uses in the stream in light of existing and potential water developments including the economic impact of restriction of such use;



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- (D) Establishment or modification of an instream flow standard shall be initiated by the commission by providing notice of its intention to set an instream flow standard in a newspaper of general circulation published in the vicinity of the stream in question, to the mayor of the appropriate county, and to persons who have previously requested such notice in writing;
- (E) After giving notice of its intention to set an instream flow standard, the commission or other agencies in participation with the commission shall investigate the stream. During the process of this investigation, the commission shall consult with and consider the recommendations of the department of health, the aquatic biologist of the department of land and natural resources, the natural area reserves system commission, the University of Hawaii cooperative fishery unit, the United States Fish and Wildlife Service, the mayor of the county in which the stream is located, and other agencies having interest in or information on the stream, and may consult with and consider the recommendations of persons having interest in or information on the stream. In formulating the proposed standard, the commission shall weigh the importance of the present or potential instream values with the importance of the present or potential uses of water from the stream for non-instream purposes, including the economic impact of restriction of such uses. In order to avoid or minimize the impact on existing uses of preserving, enhancing, or restoring instream values, the commission shall consider physical solutions, including water exchanges, modifications of project operations, changes in points of diversion, changes in time and rate of diversion, uses of water from alternative sources, or any other solution; continued
- (F) Before adoption of an instream flow standard or modification of an established instream flow standard, the commission shall give notice and hold a hearing on its proposed standard or modification;
- (2) Establish interim instream flow standards;
- (A) Any person with the proper standing may petition the commission to adopt an interim instream flow standard for streams in order to protect the public interest pending the establishment of a permanent instream flow standard;
- (B) Any interim instream flow standard adopted under this section shall terminate upon the establishment of a permanent instream flow standard for the stream on which the interim standards were adopted;
- (C) A petition to adopt an interim instream flow standard under this section shall set forth data and information concerning the need to protect and conserve beneficial instream uses of water and any other relevant and reasonable information required by the commission;
- (D) In considering a petition to adopt an interim instream flow standard, the commission shall weigh the importance of the present or potential instream values with the importance of the present or potential uses of water for non-instream purposes, including the economic impact of restricting such uses;

The issue before the Commission in this case is an amendment to the Interim Instream Flow Standard, not the Instream Flow Standard.

The Instream Flow Standard ("IFS") requires a more rigorous investigation and consultation process than the Interim Instream Flow Standard ("IIFS") in part because a "permanent" IFS implies that after a comprehensive study, the conclusion is more certain and there will be less reason to revisit the situation absent compelling changes. The fact that the interim standard is adopted more quickly does not alter the Commission's duty to protect instream uses.

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- (E) The commission shall grant or reject a petition to adopt an interim instream flow standard under this section within one hundred eighty days of the date the petition is filed. The one hundred eighty days may be extended a maximum of one hundred eighty days at the request of the petitioner and subject to the approval of the commission;
- (F) Interim instream flow standards may be adopted on a stream-by-stream basis or may consist of a general instream flow standard applicable to all streams within a specified area;
- (3) Protect stream channels from alteration whenever practicable to provide for fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses;
- (A) The commission shall require persons to obtain a permit from the commission prior to undertaking a stream channel alteration; provided that routine stream bed and drainageway maintenance activities and maintenance of existing facilities are exempt from obtaining a permit;
- (B) Projects which have commenced construction or projects reviewed and approved by the appropriate federal, state, or county agency prior to July 1, 1987, shall not be affected by this part;
- (C) The commission shall establish guidelines for processing and considering applications for stream channel alterations consistent with section 174C-93;
- (D) The commission shall require filing fees by users to accompany each application for stream channel alteration;
- (4) Establish an instream flow program to protect, enhance, and reestablish, where practicable, beneficial instream uses of water. The commission shall conduct investigations and collect instream flow data including fishing wildlife, aesthetic, recreational, water quality, and ecological information and basic streamflow characteristics necessary for determining instream flow requirements.

The commission shall implement its instream flow standards when disposing of water from state watersheds, including that removed by wells or tunnels where they may affect stream flow, and when regulating use of lands and waters within the state conservation district, including water development. [emphasis added]

In 1988, the legislature amended Part III (Hawaii Water Plan) of the Water Code to require the Commission to

[i]dentify rivers or streams or a portion of a river or stream, which appropriately may be placed within a wild and scenic rivers system, to be preserved and protected as part of the public trust.

Haw. Rev. Stat. § 174C-31(c)(4).

No such rivers or streams have yet been identified.

Hydrological conditions in the Hawaiian Islands differ sharply from those found on the continental United States. Compared with rivers and streams on the mainland, Hawaii's streams are steep, short, small, and fragile.

Runoff dominates stream flow in Hawaii and is responsible for highly variable stream flows. In normal situations, the median flow would approximate the average flow, but this is not true for Hawaiian streams. In Hawaii, streams exceed average flow just 10% of the time.

Hawaii Stream Assessment (1990), p. 5 (1991).

The Commission has found it difficult to quantify an instream flow that corresponds to a biological condition for a given flora or fauna. As a result, the methods used on the continental United States to determine an appropriate instream flow have proven unsuitable in Hawaii.

The Water Code provides for the establishment and modification of both interim and permanent instream flow standards on the assumption that scientific data will eventually provide firm knowledge about streams upon which to reach some permanent solution. Haw. Rev. Stat. § 174C-71. Unfortunately, such firm knowledge will require considerably more work and is years away. Until that scientific knowledge is available, stream management decisions will require a methodology that recognizes the preliminary and incomplete nature of existing evidence.

Given the long term work needed to define an ecologically necessary flow in a particular stream, the Commission will need to amend "interim" instream flow standards periodically until permanent standards can be adopted. Both interim and permanent standards can be changed on the basis of additional information and new biological studies. Both employ the same legal test of weighing "the importance of present or potential instream values with the importance of present or potential uses of water for non-instream purposes, including the economic impact of restriction of such uses." Both must be implemented when disposing of water from state watersheds and when regulating water in the conservation district. Both are conditions in any water use permit.

From the long term vantage point of science, the biological and environmental evidence regarding streams is preliminary. The data collection is just beginning. The conclusions are tentative. In some areas, experts are even hesitant to offer opinions. For the foreseeable future, it will be necessary to manage and protect streams through a system of working presumptions rather than on the basis of firm scientific knowledge.

## 2. Windward Oahu Interim Instream Flow Standard

The Commission adopted interim instream flow standards in December, 1988 and in May, 1992, which maintained the then existing status quo until a better understanding of Hawaii's streams could be realized. The Commission established the interim flow on the basis of the existing water diversion structures (by which daily stream flows may vary depending upon rainfall, the configuration of the diversion structure, designed releases, or other factors) rather than on the basis of the biological or ecological value of any given stream flow level. At a minimum, retaining the status quo helped to prevent any future harm to streams while the scientific basis for determining appropriate instream flow standards is developed and an overall stream protection program put into place.

Different streams have different values. At one end of the spectrum, some remote streams are completely undiverted, unpolluted, and pristine. At the other end of the spectrum there are streams that are largely diverted, channelized, or effectively degraded. The Commission's central task lies in evaluating those streams between either extreme.

The interim instream flow standard for all windward Oahu streams became effective on May 4, 1992:

[HAR] § 13-169-49.1. The Interim Instream Flow Standard for all streams on Windward Oahu as adopted by the commission on water resource management on April 19, 1989, shall be that amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted offstream through new or expanded diversion, and under the stream conditions existing on the effective date of the standard, except as may be modified by the following conditions:

- (1) Based upon additional information or a compelling public need, a person may petition the commission on water resource management to amend the standard to allow future diversion, restoration, or other utilization of any stream flow.
- (2) The commission reserves its authority to modify the standard or [new] establish new standards, including area-wide or stream by stream standards, based upon supplemental or additional information.
- (3) In any proceeding to enforce the instream flow standard, the commission, its delegated hearings officer, or a judicial officer may abate the enforcement proceedings if, under the circumstances and weighing the importance of present or potential instream values with the importance of present or potential uses of the water for non-instream purposes (including the economic impact of restricting such uses), the enforcement of the instream flow standard would:
  - (A) Create a substantial hardship on a use existing on the effective date of this standard; or
  - (B) Impermissibly burden a right, title, or interest arising under law.

- (4) Projects under construction or projects that have secured all discretionary permits required by appropriate federal, state, or county agencies prior to July 1, 1987 shall not be affected by this standard. [emphasis added]

HAR § 13-169-49.1.

3. Stream Restoration: Haw. Rev. Stat. § 174C-71(4)

The Water Code directs the Commission to

- (4) [e]stablish an instream flow program to protect, enhance, and reestablish, where practicable, beneficial instream uses of water. The commission shall conduct investigations and collect instream flow data including fishing, wildlife, aesthetic, recreational, water quality, and ecological information and basic streamflow characteristics necessary for determining instream flow requirements.

The commission shall implement its instream flow standards when disposing of water from state watersheds, including that removed by wells or tunnels where they may affect stream flow, and when regulating use of lands and waters within the state conservation district, including water development. [emphasis added]

Haw. Rev. Stat. § 174C-71.

In determining whether to "protect, enhance, and reestablish, where practicable, beneficial instream uses of water," under § 174C-71(4), the Commission must decide under what circumstances reestablishing higher instream flows is "practicable." Webster's Dictionary defines "practicable" as "capable of being done, effected or put into practice, with available means, feasible, capable of being used, achievable." The phrase "where practicable" implies an evaluation where the difficulty of enhancing stream flow is judged.

The Code provides for physical solutions.

In order to avoid or minimize the impact on existing uses of preserving, enhancing, or restoring instream values, the commission shall consider physical solutions, including water exchanges, modifications of project operations, changes in points of diversion, changes in time and rate of diversion, uses of water from alternative sources, or any other solution[.]

Haw. Rev. Stat. § 174C-71(1)(E).

There are at least two aspects of practicable: physical and socio-economic. For instance, it might not be physically practicable to reestablish a stream where the stream channel has been removed or built over; it might not be socially practicable to restore a stream whose floodplain has become densely populated.

In judging whether some level of enhancement is "practicable," the Commission may investigate a particular stream, ascertain its "value" in accordance with some objective standards,

estimate the instream flows required to ensure a particular stream quality, and then evaluate whether the increased flow may be achieved.

Among the factors relating to whether stream enhancement is "practicable," are the physical requirements to increase the stream flow, the reasonable and beneficial nature of the offstream uses, the availability of alternative sources of water (presently or in the future), unique public benefits from the offstream use (e.g., the "public use doctrine," see *Reppun*, 65 Haw. at 557-563 ), and any severe economic or social costs. Of course, cost alone does not render an action incapable of being done or make it unachievable. The Commission is not obliged to ensure that any particular user enjoys a subsidy or guaranteed access to less expensive water sources when alternatives are available and public values are at stake.

In this case, the conversion of sugar to diversified agriculture with its lower duty per acre water requirements (7,500 to 10,000 gal/acre/day for sugar v. 1,800 to 5,400 gal/acre/day for diversified agriculture on a twelve month moving average) means that even if the same acreage is planted, currently allocated ground water is available for other purposes.<sup>10</sup>

An additional alternative is reclaimed water. The county and the Army are both developing reclaimed water which is expected to be available at Honouliuli, (Ewa) and Wahiawa, Oahu on an incremental basis over the next ten years.

Under the Commission's August 15, 1995 Interim order No. 8 "Identifying Existing Uses Allowed to Continue," leeward Oahu landowners have been authorized to use about 9.3 mgd of Waiahole Ditch water (as measured at the North Portal under the crest of the Koolau mountains) for agricultural uses, although since August, 1995, existing uses (excluding system losses) have been only 3 to 8 mgd during the startup of diversified agriculture.

By comparison, in windward Oahu nearly all the water transported by the Waiahole Ditch (except water from the Uwau tunnel extension and the Waiahole main tunnel west of the North Portal) formerly fed the windward Oahu streams and is the only source to supplement the current base stream flow. The Waiahole Ditch water and the base stream flows are the sources that must satisfy any riparian uses, appurtenant rights, potential offstream agriculture in the affected area (except as HFDC may provide water to a limited area from its system), and enhancement of the Kaneohe Bay estuary and fisheries. Water has been released from Gates 30 and 31 to increase stream flows since December 1994 (and earlier) and is technically feasible.

Consequently, the Commission concludes that it is "practicable" to "protect, enhance and reestablish" windward instream flows to levels as provided in this decision.

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<sup>10</sup> Agricultural water use permits of approximately 53 mgd for Pearl Harbor ground water are still held by various parties and not being used.

E. Hawaiian Traditional and Customary Gathering Rights

The Hawaii State Constitution provides for the protection of traditional and customary rights:

The State reaffirms and shall protect all rights customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by ahupua'a tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778, subject to the right of the State to regulate such rights.

Haw. Const. art. XII, § 7.

The common law of the State of Hawaii is declared to include not just the decisions of the Hawaii Supreme Court, but also "Hawaiian usage" as of 1892.

The common law of England as ascertained by American decisions, is declared to be the common law of the State of Hawaii in all cases, except, as otherwise expressly provided by the Constitution or laws of the United States, or by the laws of the State, or fixed by Hawaiian judicial precedent, or established by Hawaiian usage; provided that no person shall be subject to criminal proceedings except as provided by the written laws of the United States or of the State. [L. 1892]

Haw. Rev. Stat. § 1-1.

In 1851 as a condition to resolving the newly recognized private title to lands in the kingdom of Hawaii, the Privy Council adopted a statute recognizing the rights of native tenants to "running water" and the "springs of water."

Where the landlords obtained, or may hereafter obtain, allodial titles to their lands, the people on each of their lands, shall not be deprived of the right to take firewood, house-timber, aho cord, thatch, or ki leaf, from the land on which they live, for their own private use, but they shall not have the right to take such articles to sell for profit. The people shall also have a right to drinking water, and running water, and the right of way. The springs of water, running water, and roads shall be free to all, on all lands granted in fee simple; provided that this shall not be applicable to wells and watercourses, which individuals have made for their own use. [emphasis added]

Haw. Rev. Stat. § 7-1 (1851).

The Water Code also provides for the protection of traditional and customary rights.

(c) Traditional and customary rights of ahupua'a tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778 shall not be abridged or denied by this chapter. Such traditional and customary rights shall include, but not be limited to the cultivation or propagation of taro on one's own kuleana and the gathering of hihiwai, opae, o'opu, limu, thatch, ti leaf, aho cord, and medicinal plants for subsistence, cultural, and religious purposes.

(d) The appurtenant water rights of kuleana and taro lands, along with those traditional and customary rights assured in this section, shall not be diminished or extinguished by a failure to apply for or receive a permit under this chapter.

Haw. Rev. Stat. § 174C-101.

The issues presented in this case do not involve action under this chapter to "abridge or deny" any traditional or customary right. Nor does this case present any issues where an individual claimed denial of physical access to streams or to the ocean.<sup>11</sup> Finally, persons seeking to raise Hawaiian traditional and customary claims have not been denied standing to participate in a contested case.<sup>12</sup>

In addition to protecting "running water," the Commission's duty with regard to gathering in streams under Haw. Rev. Stat. § 174C-101(c) is principally to establish instream flows sufficient for gathering where such gathering is otherwise allowed. While the Commission may take into account actual and historical gathering practices in a particular stream or streams, the Commission does not adjudicate which individuals may or may not gather in streams. That determination lies with the courts or with the appropriate land use authority.

The amended interim instream flow standard established by this decision will restore a base flow of Waiahole Ditch water into windward streams approximately double the 1992 Q90 level. In addition, the supplemental flows described in this decision (from water which is: 1) permitted, but unused; and 2) water not subject to any permit) will significantly enhance the stream levels at least in the initial stages.

While the evidence provided no firm basis for determining that a given stream flow quantity or the reduction of exotics alone would insure traditional gathering of a particular magnitude, testimony at the hearing indicated that traditional and customary gathering practices in Waiahole stream had continued even during the 1960's long after the full diversion of Waiahole water had occurred. At any given time, the quantity of o'opu or hihikai in a particular stream may also be affected by a variety of factors unrelated to stream flow, such as the number of individuals gathering in the stream, stream alterations, exotic species, the degradation of surrounding lands, and the consequent runoff.

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<sup>11</sup> Unlike *Kalipi v. Hawaiian Trust Co.* 66 Haw. 1. 656 745 P.2d (1982) or *Pele Defense Fund v. Paty*, 73 Haw. 578, 837 P.2d 1247 (1992) cert. denied 113 S.Ct. 1277 (1993), this is not an access case. No person sought and was denied access to windward Oahu streams or to Kaneohe Bay.

<sup>12</sup> Unlike the situation in *Public Access Shoreline Hawaii v. Hawaii County Planning Commission*, 79 Haw. 425, 435, 903, P. 2d ("PASH") representatives of Hawaiian interests were not excluded from the administrative contested case hearing. A variety of representatives of native Hawaiian interests (the office of Hawaiian Affairs, Waiahole-Waikane Community Association, Hakipuu ohana, Ka Lahui Hawaii, Department of Hawaiian Home Lands, and the Bishop Estate) were admitted as parties to the contested case and had a full and fair opportunity to present their claims.



Notwithstanding this evidence, it is clear that to the extent that stream flows are protected and enhanced, traditional and customary Hawaiian gathering rights are protected and enhanced. To a large degree, instream flow determinations incorporate or subsume Hawaiian gathering practices because both address the quantity and quality of water in a stream.

Traditional and customary Hawaiian practices that require use of water outside of the stream (e.g., agriculture) are protected under appurtenant and riparian rights associated with particular lands.

In establishing these amended base standard and supplemental flows, the Commission reviewed its rules to insure compliance with and considered the objectives and policies of the Coastal Zone Management Act. Haw. Rev. Stat. §§ 205A-2, -4, and -5. In particular, the Commission heard testimony and received considerable evidence regarding the effect of stream flows not only on the streams themselves, but upon Hawaiian gathering rights, Hawaiian traditional and customary practices, the ecology of streams and Kaneohe Bay, cultural, historical, aesthetic, recreational, scenic, and open space values as well as the need for economic (primarily agriculture) development both in Leeward and Windward Oahu. Public Access Shoreline Hawaii v. Hawaii County Planning Commission, 79 Haw. at 435.

The Commission concludes that native Hawaiian traditional and customary practices, Hawaiian gathering rights, and Hawaiian cultural and historical values are not being denied, may continue, will be protected, and, in fact, will be enhanced to the extent that higher interim instream base flows and supplemental flows affect traditional and customary practices. Bishop Estate's customary claims regarding leeward Oahu have no relevance to windward stream flows.

We turn now to the proposed offstream uses and the water use permit applications filed for those uses.

#### F. Water Use Permits

The following landowners filed water use permit applications. Most of the landowner applicants were joint applicants with the Waiahole Irrigation Company.

Estate of James Campbell and WIC  
Robinson Estate and WIC  
Dole/Castle & Cooke and WIC  
Nihonkai and WIC  
State of Hawaii Department of Agriculture and WIC  
Mililani Memorial Park and WIC  
Mililani Golf Club and WIC  
Royal Oahu Resorts and WIC  
Kamehameha Schools/Bishop Estate  
Puu Makakilo  
West Beach Estates

1. Conditions for a Water Use Permit: Haw. Rev. Stat. § 174C-49(a)

An applicant for a water use permit has the burden of establishing that, at a minimum, the applicant meets certain conditions. Section 49(a) of the Water Code provides that

[t]o obtain a permit pursuant to this part, the applicant shall establish that the proposed use of water:

- (1) Can be accommodated with the available water source;
- (2) Is a reasonable-beneficial use as defined in section 174C-3;
- (3) Will not interfere with any existing legal use of water;
- (4) Is consistent with the public interest;
- (5) Is consistent with state and county general plans and land use designations;
- (6) Is consistent with county land use plans and policies; and
- (7) Will not interfere with the rights of the department of Hawaiian home lands as provided in section 221 of the Hawaiian Homes Commission Act.

Haw. Rev. Stat. § 174C-49(a).

For the leeward water use permit applicants we examine each condition of § 174C-49(a) in turn:

a. Available Water Supply (§ 174C-49(a)(1))

The Commission has separately set amended interim instream flow standards for windward streams affected by the Waiahole Ditch and established a framework involving supplemental flows which will assist in the determination of the appropriate long term measures necessary to protect instream values in windward Oahu. At least for the near term, water quantities in excess of the amended interim instream flow standard and subject to the conditions affecting supplemental flows are available at the present time to satisfy water use permit applicants for those existing and future offstream uses identified in the Decision and Order; provided however, that other permit requirements are met; and provided that the water is not needed to meet windward surface water or ground-water rights or later to meet final instream flow standards.

This determination does not mean that the City and County of Honolulu's projected growth demands can be satisfied from Waiahole Ditch water; rather the county's projected needs will require even greater analysis. The evidence presented in this case indicates that by the year 2020, water demand for Oahu's projected growth (an additional 90 mgd) will exceed the island's estimated remaining ground-water supply (76 mgd) by at least 14 mgd.

Royal Oahu Resorts withdrew its application in this matter after obtaining a separate water use permit to pump Pearl Harbor ground water. Therefore, Royal Oahu Resorts application here is moot and, accordingly, dismissed.

The Commission concludes that after the amended interim instream flow standard and other instream flow protections established in this Decision and Order are implemented, and subject to the terms and conditions in this Decision and Order, there is water collected by the Waiahole Ditch

system available to satisfy water use permit applications for uses now in existence as well as some future agricultural uses as set forth in the Decision and Order.

b. Reasonable-Beneficial Use (§ 174C-49(a)(2))

The Water Code and the common law of Hawaii, like most states, require that all water uses be reasonable-beneficial. These terms have special meaning in water law. The Water Code defines "reasonable-beneficial use" as the

use of water in such a quantity as is necessary for economic and efficient utilization, for a purpose, and in a manner which is both reasonable and consistent with the state and county land use plans and the public interest.

Haw. Rev. Stat. § 174C-3.

There are three aspects to the reasonable-beneficial use requirement.

First, the quantity or amount of water must be necessary for economic and efficient use. The amount used may not exceed that which the water user actually needs. Thus, waste is prohibited under this standard. However, the statutory standard is more demanding than simply a "no waste" test. The use must also be economic and efficient. An economic use must generate productive value. Efficient implies effective and competent use of water, the least wasteful method of application. This is an affirmative duty to adhere to appropriate standards. For example, where more efficient means of delivering water are commonly available (e.g., drip or sprinkler rather than furrow irrigation; clean auwais as opposed to overgrown and clogged auwais) they must reasonably be employed unless there is some compelling reason why they cannot be utilized.

Second, the manner of use must be reasonable and consistent with the state and county land use plans and the public interest. Thus, one may not cause harm to others or to the resource. For example, the application of pollutants or the overdrafting of an aquifer could harm both others and the resource. Or growing a crop which requires a very high duty of water in an arid region may be "economic" and "efficient," but it may use so much of the available source so as to deprive and harm others relying upon the same source. The use of surface water outside the watershed to irrigate golf courses in an arid region will not be a reasonable beneficial use if alternatives, including reusable wastewater, are available and other needs dependent exclusively upon surface water would be frustrated. A proposed golf course use would have to show that no alternatives are available.

Third, the purpose must be reasonable and consistent with the state and county land use plans and the public interest. At the outset, the Commission finds that water for diversified agriculture on land zoned for agriculture is clearly recognized as a general matter of state policy to be in the public interest. Where there is an adequate supply of water for present and future uses, the threshold inquiry might be satisfied by such a prima facie showing. However, in situations where there are competing applications for a limited or inadequate supply of water to meet growing demand and it is not possible to satisfy all permit applicants (even if the applicants otherwise meet the permit requirements and have the appropriate land use classification and zoning), a higher level of scrutiny will be required. See also Haw. Rev. Stat. § 174C-54.

In this case, the initial water use permit applications and the petitions to amend the interim instream flow standard each sought all of the water in the Waiahole Ditch. After the hearing and after the permit applications have been reviewed and conformed to the evidence, the Commission concludes that there is adequate water to meet the immediate water use needs as set forth in the Decision and Order. Moreover, in this case, a variety of management and legal factors postpone the need to fully analyze the affirmative "public interest" tests in the context of deciding "reasonable beneficial use." Among these factors are: 1) the obligation not to waste; 2) the release into windward streams of permitted but not used, ground water, 3) the release into windward streams of unallocated ground water, 4) the ditch operation and management plan; 5) conservation measures; 6) the availability of alternative sources (ground water and reusable wastewater); 7) the four year non-use provisions of the Code (Haw. Rev. Stat. § 174C-58); 8) compliance review (Haw. Rev. Stat. § 174C-58); and 9) low near term demand. Thus, careful management may defer the need to consider a higher level of scrutiny in analyzing the "public interest" test until the time when there is inadequate water for competing demands.

Where, finally, there is inadequate supply for competing needs, both the "public interest" test and the examination of "reasonableness" will require more than a prima facie showing. As competition for water resources increases, the analysis of both the public interest and of reasonableness must become both more rigorous and affirmative. The counties will be required to articulate their land use priorities with greater specificity. For example, even at the present time, there is more land zoned for various uses than available water to supply those proposed uses. Thus, it is not sufficient to merely conclude that a particular parcel of land is properly zoned and that the use is "beneficial." That minimal conclusion may be inadequate to resolve situations in which competitive demand exceeds supply. Further analysis of public interest criteria relevant to water (e.g., conservation, alternative uses, comparative public costs and benefits) will be needed.

Thus, the "public interest" test in the definition of "reasonable-beneficial use," in section 49(a)(4), and in sections 50(h) or 54, concerning competing uses or competing applications, may be expected to evolve over time from: 1) a limited prima facie showing; 2) to management and sharing situations; 3) to final choice competition.

In this case, the Commission concludes that for diversified agriculture, a duty of 2,500 gallons per acre per day on a twelve month moving average takes into account high start up requirements and lower regular demands as well as seasonal variations. Where historical actual use has been lower (as in the case of pineapple), the Commission has adopted the actual lower number. There was evidence for both higher and lower quantities. However, the flexibility in operational requirements and the duty not to waste should provide the appropriate safeguards in either direction.

The Commission concludes that Puu Makakilo is a golf course use which reasonably requires 0.75 mgd and may do so. However, Puu Makakilo will be subject to special requirements including a duty to seek alternative sources when they are reasonably available in the near future.

Mililani Golf Course had an existing use over a potable aquifer and was making a reasonable-beneficial use of 1500 gallons/acre/day. It may continue to do so; however, the Mililani Golf Course also has a duty to use alternative sources when they are reasonably available.

The Commission further concludes that existing non-agricultural uses by the Mililani Memorial Cemetery and the State of Hawaii Waiawa Correctional Facility have demonstrated reasonable beneficial uses based upon their actual practices and upon the recognized public interest in their respective operations. See Decision and Order Table No. 3.

The Commission concludes that the water use permit applicants' gallons per acre per day duty for water uses identified in Tables 3 and 4 of the Commission's Decision and Order are "reasonable-beneficial uses."

West Beach Estates did not sufficiently establish a reasonable beneficial use. West Beach Estates' claims were too speculative as to when, how, and at what costs it would operate. Treated effluent is appropriate for use over the brackish Ewa caprock. Golf course and landscaping uses over the brackish Ewa caprock on the southwest coast of Oahu are increasingly being encouraged to use treated effluent from the county's Honouliuli wastewater treatment facility rather than low salinity surface water or ground water. West Beach Estates failed to show that alternatives to windward stream water (reused wastewater or, in the near term, nearby ground water) are not available.

The State Department of Agriculture's proposed use of water for an agriculture park is still in the planning stage and not yet certain enough to assure actual use within a reasonable time frame.

c. Not interfere with any existing legal use of water (§ 174C-49(a)(3))

The water use permit applications here seek to use the same water sources that earlier provided water through the Waiahole Ditch system to Oahu Sugar Company for sugar cultivation in leeward Oahu. The applications do not propose to remove water from any other "existing" use, legal or otherwise. Consequently, the Commission concludes that the water use permit applications do not on their face "interfere with any existing legal use of water."

However, as noted earlier, the high level ground water that supplies the Waiahole Ditch formerly fed the windward streams in the immediate vicinity. Consequently, the use of this ground water is always subject to surface water rights, Reppun, 65 Haw. 531, and, if necessary, instream flow requirements as they may be amended from time to time.

Moreover, correlative rights to use windward Oahu ground water are a shared use right and thus may be subject to cutbacks where the supply is insufficient for all other overlying landowners. City Mill Co. v. Honolulu Sewer and Water Comm., 30 Haw. 912, 928-933 (1929). See below for a discussion of common law correlative rights.

d. Consistent with the public interest (§ 174C-49(a)(3))

The Commission discussed the public interest test generally in the earlier context of defining "reasonable-beneficial" use (see above). The Commission concludes, generally, that agricultural uses are consistent with the public interest for purposes of this condition where, after the evidence is evaluated, adequate water is found to be available. In situations where there is competition for limited or scarce water resources (including instream use protection), the standard of review will be

higher than in situations where adequate water is available to meet near term agricultural needs. (See discussion of "public interest" as part of "reasonable beneficial use" test above.)

The Commission also concludes that existing golf course and other non-agricultural existing uses are already subject to this higher standard, in light of higher uses for windward surface water, including retaining the water in the streams. This conditional approval for non-agricultural uses is subject to review in the future as alternative sources become available and as instream flow requirements are determined.

- e. Consistent with State and county general plans and land use designations (§ 174C-49(a)(5))

All of the water use permit applications propose uses on lands that have the proper State and county general plan and land use designations except for Bishop Estate. Bishop Estate's existing agricultural uses met this requirement, but its future uses do not. Bishop Estate may apply for additional water as a landowner overlying ground water at such time that it obtains the proper land use classification, development plan approvals, and zoning changes, and when it may be determined that the actual use of water will commence within a reasonable time frame for a proposed project.

- f. Consistent with county land use plans and policies (§ 174C-49(a)(6))

The Commission concludes that all of the proposed water use permit applicants have or propose uses that are "consistent with county land use plans and policies" except Bishop Estate as noted above. While these applications are all "consistent" with such land use plans and policies, the lack of priority among the county plans and policies only provides a minimal standard by which to judge applications.

- g. Will not interfere with rights of HHCA (§ 174C-49(a)(7))

The Commission concludes that the water permitted for use under this Decision and Order will not interfere with the rights of the Hawaiian Homes Commission under § 221 of the Hawaiian Homes Commission Act of 1921 and sections 174C-49(a)(7) and 101(a) of the State Water Code. Adequate water remains available for the HHCA needs. Moreover, the Hawaiian Homes Commission has a "first call" under HHCA § 221 on waters from public lands.

Finally, we note that uses on the Waiahole McCandless pipe will require a water use permit. The Commission staff will review the situation to determine who should make such an application.

## 2. Existing Uses: Haw. Rev. Stat. § 174C-50

Existing uses which are the subject of a water use permit application must meet the Water Code requirements and be subject to permit conditions as any permit holder. While as a practical matter, most existing uses meet the law's requirements, prior uses are not automatically granted a water use permit (so called "grandfathering") just because they were in place on the date an area is designated. That could be inconsistent with constitutional requirements and the burden of proof

established in the Water Code. In the future some existing uses may be subject to modification to satisfy superior claims (e.g., unexercised appurtenant rights).

### 3. Competing Uses: Haw. Rev. Stat. § 174C-54

The Water Code provides that where there are two or more competing applications for the same water, the Commission must first seek to accommodate both, but if that is not possible, then approve the one that best serves the public interest.

Competing applications. If two or more applications which otherwise comply with section 174C-49 are pending for a quantity of water that is inadequate for both or all, or which for some other reason are in conflict, the commission shall first seek to allocate water in such a manner as to accommodate both applications if possible; second, if mutual sharing is not possible, then the commission shall approve that application which best serves the public interest.

Haw. Rev. Stat. § 174C-54.

In this case, the water use permit applications on their face competed among themselves for Waiahole Ditch water because, at least initially, permit demand exceeded supply and the petition for some additional instream flows in windward Oahu streams meant that the total water demand exceeded the Waiahole Ditch system supply. Moreover, the water use permit applicants were for "other reason[s]" "in conflict" with the petitions to amend the interim instream flow standard because each effectively applied for all of the available water. *Id.* After the evidence was weighed and reasonable beneficial uses evaluated, the scope of competition narrowed significantly.

Among the proposed new uses was West Beach Estates' golf course and landscaping application. West Beach Estates lies over the Ewa Plain caprock on which brackish water may be used without harm to the aquifer. Other golf and landscaping uses over the Ewa caprock are being strongly encouraged to use treated effluent which should be available from the county in the near future. It would be inconsistent with the Commission's policy over the Ewa caprock to create an exception here. Moreover, the transport of water affecting windward streams across the island to Ewa for new non-agricultural purposes, when other water sources are available, further reduces the protection afforded the stream ecosystem by keeping water in its area of origin. For this reason, it is presumptively disfavored.

Other non-agricultural uses in leeward Oahu for golf course and landscaping uses which could utilize available ground water or treated effluent also carry a heavy burden to show why stream water should be diverted out of its watershed of origin, even though central Oahu is closer to windward Oahu than the Ewa Plain. In the short term, uncertainty regarding the use of treated effluent over a potable aquifer, existing infrastructure to move Waiahole Ditch system water, and the need to study instream flow needs all mitigate in favor of continuing the use of Waiahole water for 1992 uses.

Likewise, the continued use of Waiahole Ditch water through the existing ditch system to preserve agriculture in central Oahu on lands in sugar production in 1992 ("footprint" lands) as well as on other lands in central Oahu suitable for agriculture has important value. If and until

treated effluent or ground water is available, the State has a strong interest in retaining agriculture on these lands. Where instream flow values may be protected and offstream agricultural uses maintained, both "uses" are accommodated in the manner promoted by Haw. Rev. Stat. § 174C-54.

#### G. Hawaii's Common Law for Ground Water

Under Hawaii's common law, the right to use ground water is governed by the "rule of correlative rights." City Mill Co. v. Honolulu Sewer and Water Comm., 30 Haw. 912, (1929). Although the particular facts in City Mill involved artesian water, the case suggests no principled basis for distinguishing between artesian and percolating ground water especially in light of modern hydrological knowledge about the movement of water underground. The City Mill decision refers with approval to case law and legal treatises which state that percolating water is governed by correlative rights. City Mill, 30 Haw. at 927-930. The Water Code defines "[g]round water" all inclusively as

any water found beneath the surface of the earth, whether in perched supply, dike confined, flowing, or percolating in underground channels or streams, under artesian pressure or not, or otherwise.

Haw. Rev. Stat. 174C-2.

Thus, all owners of lands overlying a body of water have rights to the waters of that basin; [provided] that each may use water therefrom as long as he [/she] does not injure thereby the rights of others and that in times when there is not sufficient for all[,] each will be limited to a reasonable share of the water.

City Mill Co. v. Honolulu Sewer and Water Comm., 30 Haw. at 923.

In City Mill, the Hawaii Supreme Court rejected the so called "common law doctrine" and held that overlying land owners do not absolutely own the water. Id. at 922-23. Under the "common law" doctrine a person could take any amount of water and use it anywhere or waste it. Id. at 922. The Court also rejected the so called "American reasonable use doctrine" under which a landowner could take all the available ground water provided he or she uses it productively on his or her overlying land. Id. at 922-928. Under the "reasonable use" rule, there would be no limit to the quantity of water that may be used, provided it is used on the owner's land. Id. at 923.

The Court did adopt the "correlative rights" doctrine by which an overlying landowner has a use right that is associated with the overlying land, shared with other owners of overlying land, but which extends only to that overlying land. The use must be reasonable in relation to uses of other overlying landowners, the characteristics of the overlying parcel, and the characteristics of the aquifer. City Mill Co., 30 Haw. at 923; Ascii v. Walkinshaw, 141 Cal. 116, 74 P. 766 (1903); Burr v. Maclay Rancho Water Co., 154 Cal. 428, 434-35, 98 P. 260 (1908); Tarlock, Law of Water Rights and Resources, § 4.06 (1990); Sax, Abrams, and Thompson, Legal Control of Water Resources, 388-392, 426-437, 448-456 (1991).

Where shortages occur, the Water Code requires the Commission to adopt a shortage plan or in some cases emergency orders which may include physical solutions such as temporarily "apportioning, rotating, limiting, or prohibiting" various uses if that is possible. Haw. Rev. Stat. §



174C-62. If physical solutions are not possible, then ground-water shortages are to be "settled by giving to each [landowner with correlative rights] a fair and just proportion." *Id.* Thus, by definition, the rule of correlative rights is not a prior appropriation model where "first in time, first in right" governs and where cutbacks (under the prior appropriation doctrine) are based upon a "last in, first out" rule.

The correlative rights doctrine, by its own terms, does not protect uses that take place off the overlying land, namely, water exporters. *Katz v. Walkinshaw*, 141 Cal. 116, 74 P. 766 (1903). Transfers out of a watershed in fact depend upon there being a surplus of available water within the water basin. As the Hawaii Supreme Court stated in *City Mill*, "[u]nder this . . . [correlative rights] rule[,] a diversion of water to lands other than that of origin might, perhaps, be permitted under some circumstances and not under others . . . . *City Mill*, 30 Haw. at 923. Thus, while use of the water away from the overlying land is not prohibited, such exportation is potentially subordinate to the needs of overlying landowners and could be subject to injunction to prevent harm to those overlying landowners. *Wright v. Goleta Water District*, 174 Cal. App. 3d 74, 219 Cal. Rptr. 740 (1985).

Under the Water Code, water may be transported away from the overlying land with a water use permit, if the Commission determines that such use is consistent with the public interest and the State and county general plans and land use policies. Haw. Rev. Stat. § 174C-49(c). As further discussed below, the ability to transport water away from its overlying land or area of origin is conditional and subject to other superior claims.

In a shortage situation, overlying landowners may have superior claims to water exporters. *Katz, supra*.

However, this case presents new applications, not cutbacks. Therefore, the Commission reserves and does not decide how cutbacks in shortage situations might be apportioned. Nonetheless, while the water use permits approved by the Commission grant important shared use rights in ground water, they do not establish absolute priorities.

Bishop Estate has correlative rights to ground water underlying its land and may apply for a permit under the Water Code for an appropriate portion of that water when a need can be demonstrated and the permit conditions satisfied. Bishop Estate's customary and other claims are not relevant here.

#### H. Out-of-Watershed Transfers: Haw. Rev. Stat. § 174C-49(c)

One of the most important changes which the Water Code makes to Hawaii's common law is the express, but conditional, authority to "transport and use surface or ground water beyond overlying land or outside the watershed from which it is taken." This authority requires the Commission to determine that such transport is in the public interest and that it is consistent with the general plans and land use policies of the State and counties.

- (c) The common law of the State to the contrary notwithstanding, the commission shall allow the holder of a permit to transport and use surface or ground water beyond overlying

land or outside the watershed from which it is taken if the commission determines that such transport and use are consistent with the public interest and the general plans and land use policies of the State and counties.

Haw. Rev. Stat. § 174C-49(c).

In light of Hawaii's constitutional requirements, the very nature of appurtenant and riparian rights, and the terms of the Code itself, the right to export water away from the watershed or the aquifer is necessarily a conditional right. Haw. Const. art. XI, §§ 1 and 7; XII § 7; Reppun, 65 Haw. 531; Robinson, 65 Haw. 641; McBryde, 54 Haw. 174; City Mill, 30 Haw. 912. Whether on their own force or as part of the "public interest" analysis, the constitutional and common law requirements condition out-of-watershed transfers.

This conditional right is subservient to superior claims of overlying landowners in the case of ground water and the superior claims of landowners with riparian and appurtenant rights in the case of surface water. Id. In this case, surface water claims could not be and were not presented for consideration or decided because windward surface water was not declared part of the water management area. Windward surface water claims remain outstanding. Moreover, any export of water from its area of origin is always subject to the requirements that the utility or quality of the ground-water source not be impaired (sustainable yield) or that the quantity or flow required to protect the beneficial instream uses as determined by the Commission be maintained (instream flow standards).

I. Weighing Instream Values and Offstream Uses: A Program to Protect Instream Values Under Haw. Rev. Stat. § 174C-71.

Finally, the Water Code requires that the Commission set interim instream flow standards by weighing the importance of present and potential instream values with the present and potential uses of water for offstream uses, including the economic impact of restriction of such uses. Haw. Rev. Stat. § 174C-71(2)(D).

Based upon the evidence and record in this case, the Commission concludes that a more definitive determination of the proper instream flows for windward Oahu depends upon the collection of additional information and the subsequent weighing of instream values and offstream uses in accordance with the framework described in this Decision and Order. The Commission draws the following conclusions and establishes the following guidelines in weighing the competing values and setting amended interim instream flow standards for windward Oahu streams.

The underlying responsibility of the Commission is to protect water resources as a public trust resource. The State Water Code is an expression of how the Commission is to exercise this responsibility. The Code, based on the constitutional provisions of the theory of public trust, charges the Commission with defining and balancing various public interests.

1. Windward Oahu ground water, streams, and Kaneohe Bay are part of the public trust res and are subject to review under the State's public trust responsibility as expressed in the State Water Code.

2. The purposes of the public trust and the public trust doctrine include, among others, the preservation of Hawaii's fresh water natural resources and waterways for the protection of Hawaii's

natural environment for this and for future generations, for public values related to fishing, commerce and navigation, recreation, scenic value, the scientific study of the natural ecology, and for traditional and customary Hawaiian practices and customs.

3. The State and its Commission on Water Resource Management have a duty of ongoing supervision over fresh water resources to ensure their protection and where practicable, the restoration of streams.

4. The State's and the Commission's first duty with regard to water resources, is to protect the water resource. Haw. Const. art. XI, § 7. The level of that protection may change with circumstances. In the case of ground water, the sustainable yield is the "maximum rate at which water may be withdrawn from a water source without impairing the utility or quality of the water source as determined by the commission." Haw. Rev. Stat. § 174C-2. The surface water corollary to the ground water "sustainable yield" is the "instream flow standard." The instream flow is defined as the

flow or quantity of water which is required to be present at a specific location in a stream system at certain specified times of the year to protect fishery, recreational, aesthetic, scenic, and other beneficial instream uses.

Id.

5. The testimony and evidence in the record indicate that, generally, the higher the volume of instream flow and the closer the stream flow approaches its natural pre-diversion levels, the greater the support for biological processes in the stream and its ecosystem. The quantity of water needed to maintain or restore particular flora or fauna is not precise and, therefore, must remain approximate.

While high storm runoff flushes exotics out of streams, experts were not yet able to provide a particular base instream flow necessary to achieve specific results for given species of fish. This mitigates in favor of further research and caution.

6. The offstream uses identified by the Commission that are appropriate for water use permits are identified in the Decision and Order, Tables 3 and 4. The agricultural uses include lands previously in sugar production as well as some additional productive agricultural lands. All these uses will now require a lower duty per acre and total volume of water for diversified agriculture. A limited number of non-agricultural uses which have been in existence or were in the process of start-up have uses which are beneficial and in the public interest in the short term until alternatives sources can be secured.

The total of these agricultural and non-agricultural off-stream uses constitute approximately 11.93 of the 27 mgd (44%) Waiahole Ditch system flow as measured at Adit 8. Another 1.58 mgd is proposed for future agricultural use.

7. Where scientific evidence is preliminary and not yet conclusive regarding the management of fresh water resources which are part of the public trust, it is prudent to adopt "precautionary principles" in protecting the resource. That is, where there are present or potential threats of serious damage, lack of full scientific certainty should not be a basis for postponing effective measures to prevent environmental degradation. "Awaiting for certainty will often allow for only reactive, not preventive, regulatory action." Ethyl Corp. v. EPA, 541 F.2d 1, 25, 5-29 (D.C. Cir. 1976) cert. denied 426 U.S. 941 (1976). In addition, where uncertainty exists, a trustee's duty to protect the resource mitigates in favor of choosing presumptions that also protect the resource. Lead Industries Ass'n v. EPA, 647 F.2d 1130, 1152-1156 (D.C. Cir. 1980).

8. Therefore, it is prudent to establish mechanisms for adjustment in the future based upon future studies. Using instream flows as a buffer is one aspect of the precautionary principle. A buffer allows for margins of error in the initial estimates and for the delay in recognizing and measuring changes. It also postpones weighing that final quantity of water to a later day when changed circumstances, experience, new understanding, or better management may refine the judgments first made here. The Commission established the 5.39 mgd of non-permitted ground water with these principles in mind.

9. The Commission concludes that there should be and hereby is established both an amended interim (base) instream flow standard and additional supplemental flows that will provide a protective method of weighing instream values over time until more complete scientific data is developed.

a. Amended Interim Instream Flow Standard.

First, by the Commission's Decision and Order, an additional 4.0 mgd will be added to the base flow of Waiahole Stream thereby doubling the Q90 level of 3.9 mgd interim instream flow standard (May 4, 1992) to, effectively, 7.9 mgd in Waiahole Stream. The Q90 level is the minimum amount of water flowing at least 90% of the time.

Similarly, an additional 2.0 mgd will be added to the base flow of Waianu Stream thereby increasing five times the 0.5 mgd interim instream flow standard (May 4, 1992) to 2.5 mgd.

These base flow amounts must always be released into windward streams. This 6 mgd additional base instream flow is more than 25% of the average total Waiahole Ditch flow measured at the North Portal (23.3 mgd).

b. Supplemental Flows.

Second, in addition to the amended interim instream flow standard base flows, there will be supplemental flows released into windward streams.

The first supplemental flow is 5.39 mgd of ground water which is not the subject of any water use permit and which will be released from the Waiahole Ditch system into windward Oahu streams, subject to future orders of the Commission. This added unallocated ground water equals

nearly one fourth (23%) of the total Waiahole Ditch flow as measured at the North Portal (23.3 mgd).

The second supplemental flow is 1.58 mgd of ground water which is not the subject of any water use permit but which is proposed as a reservation for future agricultural needs. This water will be released from the Waiahole Ditch into windward streams until such time as the Commission issues water use permits for its use. This second supplemental flow equals approximately 7% of the average 23.3 mgd North Portal measured ditch flow.

In addition to these two supplemental flows, all water which is authorized for use through water use permits, but which is not actually used by permittees, will be released into windward streams to avoid unlawful waste.

These supplemental flows will provide a field test to monitor and scientifically study the streams. As these supplemental flows may be permitted for offstream uses and the actual stream flow reduced from present levels, scientific studies will be conducted to examine the impact of reducing stream flows.

The supplemental non-permitted flow may be considered for offstream uses (unless the offstream use may be accommodated from the proposed agricultural reserve). Scientific studies under the Commission's supervision will be the basis for deciding how much of the non-permitted ground water may be used offstream.

When a water use permit application for water from the non-permitted ground water is filed and before any permit is approved, the Commission will take a "hard look" at the best available scientific and stream flow data and decide whether an amendment to the interim instream flow standard is needed. If any water use permits are issued, the permits will be subject to conditions providing for stream restoration if the Commission determines that additional water should be returned to the stream.

In reviewing the situation, the Commission will make use of the technical advisory committees which will monitor and assess how this Decision and Order is being implemented and make recommendations to the Commission and provide reports at least annually.

#### c. Overflow and Storm Flow

Gate 31 is presently configured so that the Waiahole Ditch can physically divert approximately 30 mgd to leeward Oahu. As Gates 30 and 31 are now set, any water in excess of 30 mgd spills over the gates at Waiahole Stream and at Waianu Stream and feeds those streams. Thus, high rainfall flows pass into windward streams and increase the number of days in which higher flows occur. Occasionally, a substantial flood event flushes out exotic species thereby assisting the o'opu.

10. In weighing instream values, the Commission's Decision and Order will provide a period of time in which to conduct scientific studies of the impact of supplemental and reduced flows. During this time, windward stream flows will include all or a portion of the following additional water from the Waiahole Ditch system: 1) an amended interim instream flow standard (6 mgd); 2) supplemental non-permitted ground water (5.39 mgd); 3) water proposed for reservation

for future agricultural uses (1.58 mgd); and 4) permitted, but unused agriculture water (released to windward Oahu streams when not used).

These additional flows (12.97 mgd or more) provide a basis for a long range study to determine an ecologically and biologically based instream flow standard. The stream flow requirements can be quantified pursuant to the long range studies done by the Commission as stream water may be gradually drawn down to meet offstream uses. The conversion from sugar to diversified agriculture in leeward Oahu has provided a unique situation in which (since at least 1995) 15-20 mgd has been released back into windward streams from the Waiahole Ditch system. Thus, for some time the windward streams will continue to receive 11.39 mgd (excluding proposed agriculture reservation) to 12.97 mgd (58% to 56% of the 23.3 mgd) Waiahole ditch system water (as measured at North Portal) previously diverted to leeward Oahu.

These supplemental flows provide a field test to further examine the effect of higher stream flows on reducing exotics and the parasite populations associated with them. These supplemental stream flows may also benefit Kaneohe Bay, its near shore estuary, fisheries, and marine life generally. A year round higher base level stream flow may be expected to keep predators further from the stream mouths and to increase organic nutrients which are important to estuary productivity and a healthy fishery.

11. The Commission finds that it is instructive to compare the Commission's weighing of instream values and offstream uses here with the leading case involving the public trust doctrine and fresh water resources on the continental United States, namely Mono Lake, California. The California Supreme Court described Mono Lake as "a scenic and ecological treasure of national significance." National *Audubon*, 658 P.2d 712. Mono Lake, located east of the crest of the Sierra Nevada Mountains and near the eastern entrance to Yosemite National Park is the second largest lake in California. It is home to 95% of the California gull population and 25% of the gull's total species population. 658 P.2d at 711 and 716. Moreover, "Mono Lake has long been treasured as a unique scenic, recreational, and scientific resource." 658 P.2d at 716. Notwithstanding Mono Lake's special significance, it was systematically depleted. Over twenty years, Mono Lake will be partially restored (16 feet of the 42 feet lake level originally lost).

In this contested case, the windward streams from Waiahole to Kahana have also been substantially diverted. By this Decision and Order, windward Oahu streams affected by the Waiahole ditch will recover both a base and a large supplemental flow of the Waiahole Ditch water for a period of time during which further scientific studies will be conducted. During this time also, a limited number of new permits may be issued by which the flow level may be gradually drawn down. This "draw down" may be more protective of the stream than a "build up." The amended interim instream flow standard base and the unallocated ground water alone will release 11.39 mgd (over 49% of the Waiahole Ditch water measured at the North Portal) into windward streams.

This draw down mechanism will allow the Commission to further study the stream requirements over time, acquire knowledge of the stream and the stream ecosystem, to retain control over the situation, and to act flexibly as circumstances change.

These public trust protective measures are in accordance with those adopted by the California State Water Resources Control Board in Mono Lake. "In Re Amendment of Los Angeles License for Diversion of Water From Streams Tributary to Mono Lake," Decision 1631, State of California Water Resources Control Board (September 20, 1994).

12. The studies that will be conducted pursuant to the Commission's Decision and Order are part of a larger and ongoing evaluation of Hawaii's streams that will guide Hawaii's overall stream protection and management program. Haw. Rev. Stat. §§ 174C-31(c) and 71.

The Commission's stream protection and management program recognizes that analysis of instream values and offstream uses must be undertaken in the context of both the stream itself and its relationship to other streams in the State. To begin the evaluation of Hawaii's streams on a statewide basis, the Commission co-sponsored with the U.S. National Park Service a preliminary inventory and assessment of Hawaii's 376 perennial streams entitled the Hawaii Stream Assessment (December, 1990) (HSA). The Hawaii Stream Assessment has been received, but not formally adopted by the Commission.<sup>13</sup>

Using existing literature, each stream was analyzed on the basis of four characteristics (aquatic, riparian, cultural, and recreational resources) and judged in each category as outstanding, substantial, moderate, limited, or unranked. HSA, *infra*. It did not undertake independent research or verification. It did not address water rights, Hawaiian rights, offstream uses, land ownership, economics, or provide detailed maps showing the exact location of the streams. HSA at p. xxii. However, a data base was established to inventory historic gaging, water quality, water supply, diversions, hydroelectric power, channelization, and special areas with natural or cultural areas of special value.

The Hawaii Stream Assessment inventory of Hawaii's streams and methodology reflect the judgment of natural resource managers and experts from the public and the private sectors. The Hawaii Stream Assessment may aid the Commission in determining what instream flows are needed to preserve the different stream values identified in the report.

Each of Hawaii's streams have different values and different levels of those values. HSA, *infra*. Some streams remain undiverted, unchanneled, and pristine. Other streams have been partially or fully diverted for offstream uses or channelized to control flooding. Thus, not every stream can provide nor should it be expected to provide every value or the highest level of each value. Hawaii's overall stream protection and management program must draw reasonable distinctions among streams based upon a variety of values and the quality of those values in a given stream. The Hawaii Stream Assessment made some recommendations in this direction for future action. HSA, pp. 269-285. The studies undertaken pursuant to this Decision and Order will assist in the longer term task of making those judgments.

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<sup>13</sup> The Hawaii Stream Assessment ranked Waiahole and Waikane Streams as moderate for biological resources and Kahana Stream as outstanding for aquatic resources.

The Commission has begun consideration of administrative rules to implement the stream protection and management plan.

J. Reservations of Water: Haw. Rev. Stat. § 174C-49(d).

The Department of Hawaiian Home Lands, the State Department of Agriculture, the Bishop Estate and later the office of Hawaiian Affairs all filed petitions for reservations of water under Haw. Rev. Stat. § 174C-49(d). Haw. Rev. Stat. § 174C-49(d) provides that "[t]he commission, by rule, may reserve water. . . ." Thus, reservations are processed as administrative rule making and will be taken up later in separate proceedings.

However, it is important to understand that reservations are held by the Commission, not by private or even other public entities. Hawaiian home lands constitute a special case due to the specific provisions of the Hawaiian Homes Commission Act (section 221) and the Hawaii Admission Act (section 4). The reservation in a designated water management area is a quantity of water within the sustainable yield not allocated by the Commission which is held for a general purpose (for example, agriculture) rather than for a specific entity.

From this reserved quantity of water, later water use permit applications may be satisfied provided that they come within the purpose of the reservation. The use of the water is not automatic. A water use permit must be applied for and obtained through the process established in the Water Code.

K. Conclusion

For the reasons discussed above, we conclude that the water use permits, the amended interim instream flow standards, and the management and monitoring requirements approved and established in this Decision and Order meet the requirements of law as provided in Hawaii's Constitution, the Hawaii Water Code, and the common law as determined by the Hawaii Supreme Court.

**Caveat:** Finally, if any statement denominated a conclusion of law is more properly considered a finding of fact, then it should be treated as a finding of fact; and conversely, if any statement denominated as a statement of fact is more properly considered a conclusion of law, then it should be treated as a conclusion of law.



## DECISION AND ORDER

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## **V. DECISION AND ORDER**

### **A. Introduction - Oahu's Water Future**

The Commission issues this Decision and Order based on the foregoing Findings of Fact and Conclusions of Law. The Commission reviewed testimony on the present and potential instream values and the present and potential uses of water for noninstream purposes, including the economic impact of restricting such uses, and applied Hawaii water law and public trust principles in reaching this decision.

The Commission evaluated the testimony and record in this case within the framework of water resources on Oahu and in the State. On Oahu, the water resources are close to full development. Oahu's ground-water sustainable yield is estimated at 465 mgd, of which 416 mgd is considered developable because it has little or no impact on stream flows. Currently, ground-water allocations total 340 mgd. This leaves about 76 mgd of ground water left to accommodate future growth on the island.

The evidence presented in this case shows that by the year 2020, water demand for projected growth of Oahu will exceed the remaining ground-water resources on the island. City and County of Honolulu planners testified that the 2020 demand for water for projected growth in the Ewa, Central, Waianae, and Honolulu districts will require another 90 mgd. This increased demand consists of 56.5 mgd for potable water needs and 33.5 mgd for non-potable water needs. This is exclusive of growth demands for the rest of Oahu and new military and agricultural water demands.

The Chief Planning Officer of the City Department of Planning testified that City & County of Honolulu plans anticipate Oahu's population may increase by another 500,000 people up to 1.4 million. To support this population growth, as many as 11,459 acres of additional urban lands may be needed, an increase of about 12%. Thus, the forecasted increase in water demand (90 mgd) to accommodate this growth exceeds the remaining ground-water resources on the island (76 mgd) so that based on land use plans the ground-water supply may be completely utilized in 15 years.

A limited water supply threatens not only the State's lifestyle, but also its livelihood. In addition to the direct impact on Hawaii's already high cost of living, water supply problems may multiply impacts on Hawaii's business and economy. It may even affect the State's ability to sustain an agricultural economy, where water costs are purported to be a major expense. Thus, the scarcity of water may become an impediment to continued agriculture, ecosystem health, and social stability. The challenge for the Commission and the people of this State is to conserve, protect, transfer, recycle and sustainably manage our existing water resources more efficiently and effectively to meet the growing multiple needs of this State.

This Commission believes that Oahu's remaining ground-water resources must be directed to its highest and best use. There must be an increased emphasis on water conservation, water reclamation and reuse, and system efficiency improvements. One way to stretch Oahu's remaining resources is to utilize lower quality water for irrigation purposes, replacing the use of higher quality ground water. Thus, reclaimed water and brackish caprock water should be used for irrigation purposes whenever it is both possible and allowable.

The continuing authority of the Commission may be exercised by imposing specific requirements over and above those contained in this decision with a view to eliminating waste and to improve efficiency. Permittees may be required to implement a water conservation plan, features of which may include use of reclaimed water, suppressing evaporation losses from water surfaces, and installing, maintaining and operating efficient water measuring devices.

This Commission believes that an integrated water resource plan must be developed in order to prepare for Oahu's water future. This plan must address how we will meet water demand given our dwindling supply and must prioritize competing demands. The plan would construct various planning scenarios to help decision-makers incorporate uncertainties, environmental externalities, and community needs into decision-making. The scenarios would assess ranges of population projections and commensurate water demands. An integrated water resource plan encompasses the concept of least-cost planning and considers all types of resources equally: new supply, conservation, reclaimed water, alternative rate structures, as well as other demand management methods. The planning process would assess and balance competing needs such as urban, agricultural, appurtenant rights, traditional and customary gathering rights, Hawaiian Home Lands rights, and stream protection, and set priorities for allocation decisions.

Having weighed all the evidence presented in this case, this Commission seeks a balanced solution to obtain the maximum beneficial use of the waters of the Waiahole Ditch system while providing protection of traditional and customary Hawaiian rights, the protection and procreation of fish and wildlife, the maintenance of proper ecological balance and scenic beauty, and the preservation and enhancement of the waters of the State, within the public interest objectives of the State Water Code.

#### B. Interim Instream Flow Standard Amendment

The computed long-term (1927-1960) average flows (Q average) of Waiahole and Waianu Streams are 6.9 and 1.2 mgd respectively, for a total average flow of 8.1 mgd. The computed long-term base flows (Q90) of Waiahole and Waianu Streams are 3.9 mgd and 0.5 mgd respectively, for a total base flow of 4.4 mgd. The Q90 base flow is the percentage of time the indicated discharge is equaled or exceeded. This means that 90 percent of the time there is a given amount (or more) of water in the stream. Conversely, the flow in the stream is less than the Q90 flow only 10 percent of the time. The computed long-term average and base flows are found in Geological Survey Water-Supply Paper 1894, Table 9, page 40.

The average amount of water developed by the Waiahole Ditch system is approximately 27 mgd as measured at Adit 8 based on Waiahole Irrigation Company's 1989 to 1993 data. A comparison of the data is shown on Table 1. The 1989 to 1993 data is selected as a baseline rather than the longer 1938 to 1978 data for several reasons. The average flows for the period 1989 to 1993 were neither extraordinarily high nor were they extraordinarily low. The 1989 to 1993 time is a period after pumping from Waiahole Stream into the ditch system was stopped. The 1989 to 1993 period better reflects the conditions after the construction of the Kahana Bulkhead project.

Surface water intakes have been closed off to the point where the only major ones that exist are in Kahana Valley. Finally, the 1989 to 1993 data are the more conservative figures.

However, the stream flow and ditch flow data are taken for different time periods and may not accurately depict present day flows. The 1927 to 1960 stream flow data excluded some surface water that was pumped into the ditch from Waiahole Stream, and does not include the effects of the construction of the Uwau Tunnel extension in 1964. The 1989 to 1993 ditch data is for a short time period, and may not fully reflect the effect of the Kahana bulkhead constructed in 1992. These are the best available data and this Decision and Order will call for more accurate data for periodic review and adjustment by the Commission.

1. The Commission finds it practicable to reestablish a portion of windward stream flows affected by the Waiahole Ditch system and hereby grants in part the petitions of the Waiahole-Waikane Community Association, Hakipuu Ohana, and Kahaluu Neighborhood Board No. 29, and the Office of Hawaiian Affairs to amend the Interim Instream Flow Standard as follows:

The Interim Instream Flow Standard amended here shall include windward Oahu streams from Kahana Valley to Waiahole Stream. In addition to the "status quo flows" which are the amounts of water flowing in each of these streams on the effective date of the original standard, May 4, 1992, six (6) mgd shall be restored to certain windward Oahu streams on a continuous basis as an amended base flow. In no case shall there be less than six (6) mgd restored to windward Oahu streams. Initially, four (4) mgd shall be restored at Gate 31 and two (2) mgd shall be restored at Gate 30. The quantities restored to individual windward streams shall be subject to modification with Commission approval (see Section C.2.).

Restoration of 4 mgd at Gate 31, which releases water into Waiahole Stream, will approximately double the computed base flow (Q90) of Waiahole Stream of 3.9 mgd, for a total of 7.9 mgd. Restoration of 2 mgd at Gate 30, which releases water into Waianu Stream, will increase the computed base flow of Waianu Stream of 0.5 mgd by five times for a total of 2.5 mgd. The base flows of Waiahole and Waianu Streams combined will increase from the computed 4.4 mgd to 10.4 mgd. The "amended base flow" of Waiahole and Waianu Streams (10.4 mgd) will exceed the computed average flows of the streams (8.1 mgd) by 2.3 mgd (see Figure A).

2. The "amended base flow" (10.4 mgd), of Waiahole and Waianu Streams will be supplemented by non-permitted ground-water of 5.39 mgd (see Section G). Thus, for the near future, the amended base flow (10.4 mgd) and the non-permitted ground-water (5.39 mgd) will result in a supplemented base flow of 15.79 mgd in Waiahole and Waianu Streams (see Figure A).

3. The proposed agricultural reserve of 1.58 mgd (see Section E.3.b.) shall remain in the aforementioned streams unless and until such time as the Commission grants

new water use permits with specific amounts and locations of the use. If and until an agricultural reserve is created and later permitted, the proposed agricultural reserve water will remain in the streams along with the supplemented base flow of 15.79. Therefore, for the near future, there will be a collective minimum flow of  $15.79 + 1.58 = 17.37$  mgd (see Figure A).

4. WIC may provide up to 11.93 mgd, plus water recognized as operational losses (see section D.2.), to the Waiahole Ditch as measured at Adit 8, and shall release into windward streams any water not consumed or needed for day to day operations for any of the allocated uses or for operational losses (see section F.5.).

5. Therefore, as a practical matter, for the near future, windward streams subject to this action will contain approximately 17.37 mgd as a collective minimum flow. Over time, the 17.37 mgd could decrease to 10.4 mgd depending on the Commission's decisions concerning the proposed agricultural reserve, the non-permitted ground water and the non-regulated surface water.

6. The Commission may initiate amending the interim instream flow standard if data indicate that there is significant degradation of the streams at any time during the decrease from 17.37 mgd to 10.4 mgd.

7. The six (6) mgd restored to the streams, as well as other supplemental flows, will contribute to the protection of traditional and customary Hawaiian rights, the protection and procreation of the fish and wildlife of windward streams and Kaneohe Bay, the maintenance of proper ecological balance and scenic beauty, and the preservation and enhancement of the waters of the State, in the public interest.

8. Native Hawaiian traditional and customary practices, Hawaiian gathering rights, and Hawaiian cultural and historical values may continue, will be protected and, in fact, enhanced to the extent that reestablished stream flows affect them.

#### C. Technical Advisory Committees

The Commission shall establish technical advisory committees representing a cross-section of interests to address specific areas of concern which include, but are not limited to the following tasks:

1. Assessing present monitoring activities, including verification and calibration of the Waiahole Ditch system and Waiahole Stream flow, and recommend medium and long-term monitoring plans.

2. Recommending additional release points to windward streams.

3. Recommending additional studies necessary to determine the effects of stream flow restoration and how additional diversions could affect aquatic resources.
4. Assessing present agricultural activities and plans and recommending improvements where applicable.
5. Recommending method(s) of financing the technical studies referred to in this decision.
6. Proposing conservation measures such as using reclaimed water, suppressing evaporation losses from water surfaces, and installing, maintaining and operating efficient water measuring devices.
7. Assessing the success of the Kahana bulkhead and reviewing the possibility of using it to enhance dry weather flows in the ditch or Kahana Stream.
8. Assessing the use of treated wastewater over a potable aquifer.

The Commission shall determine and establish a preliminary list of technical advisory committees within three (3) months from the date the Final Decision and Order is issued. The committees shall submit initial reports concerning their recommended plans, goals, objectives, methods of study, etc. within five months after they are established. Annual reports shall be submitted to the Commission thereafter, unless otherwise specified.

#### D. Waiahole Ditch System

1. In light of the integrated nature of the relevant water sources and infrastructure, the Commission orders that the Waiahole Ditch system shall be regulated as a unified water system within the Waipahu-Waiawa Water Management Area and the Koolaupoko and Kahana Water Management Areas, and shall include the following:
  - a. Ground water from the high level aquifers of the Koolaupoko and Kahana Water Management Areas as developed by the Waiahole Ditch system; and
  - b. Ground water from the high level aquifer of the Waipahu-Waiawa Water Management Area as developed by the Waiahole Ditch system, including both the KSBE portion of the main transmission tunnel and the Uwau tunnel extension contribution.
2. Surface water, specifically the 2.10 mgd Kahana surface water developed by the Waiahole Ditch system is not permitted by this order and may continue to flow through the ditch system. Because there was no evidence presented concerning any present demand for the use of Kahana water, and because water should not be wasted, the Commission temporarily recognizes that 2.1 mgd Kahana surface water corresponds approximately to

operational losses. When there is a need to use Kahana surface water, the Commission may consider deducting the operational losses from the non-permitted amount. Because of the integrated nature of the delivery system, and because the permitting of Kahana surface water is not under its jurisdiction, the Commission intends to initiate the process of designation for the Kahana watershed as a surface water management area. The Kahana surface water diversions may also be considered for future restoration to Kahana Stream.

3. WIC shall continue to provide the Commission with monthly reports on water usages, acres in production, unaccounted for water, and any additional information deemed reasonably necessary by the Commission.

#### E. Agricultural Allowance

1. The Commission finds that 2,500 gallons per acre per day (gad) is a reasonable duty of water for diversified agriculture. 2,500 gad is based on testimony presented by farmers Larry Jefts and Alec Sou. Sou gave a range of water demand from 1,800 gad to 5,400 gad. Sou stated that a "comfortable zone" would be about 3,500 gad. Sou also stated that at any one point, the maximum they have in actual crop on ground is one-third (1/3) of their land, while the other two-thirds (2/3) is in various stages of harvest, plow down and arid aeration to disrupt insect buildup. Jefts confirmed that his lease and license documents says that the "average annual usage from these sources is estimated to be 2,500 gallons per day per acre of arable land being cultivated". Jefts and Sou have leases and licenses that could be terminated if they do not get at least 75 percent of 2,500 gad, or 1875 gad. Jefts stated that he does not know whether or not he could survive on less than 1,875 gad. He stated he had to pick a number and did the best he could. The Commission is selecting 2,500 gad as a starting point for agricultural uses in this particular situation. 3,500 gad may be a more generous number and may be applicable for general planning purposes. However, because diversified agriculture is just starting and may not reach full production for several years, and because there is a lack of data on actual uses for diversified agriculture, the Commission is using the more conservative 2,500 gad. It is nearer the lower end of the range of estimates but it is an adjustable number and will be evaluated periodically or upon request, based on the best available data and field experience.

2. The Commission hereby recognizes "agricultural uses" totaling 12.22 mgd, based on past agricultural usage of Waiahole Ditch system water. The 12.22 mgd consists of the following uses:

a. 10 mgd, represents approximately 4,000 acres of former OSCO sugarcane lands irrigated by the Waiahole Ditch system (when Oahu Sugar Company was in full production) which reasonably require 2,500 gad for diversified agriculture

plus



b. 2.22 mgd, represents approximately 1,552 acres of Dole/Castle & Cooke's agricultural lands which reasonably require their requested usage amounts or 2,500 gad, whichever is less, as shown on Table 2.

3. The "agricultural uses" of 12.22 mgd are further categorized as follows: a) 10.64 mgd for present "agricultural water use permits"; and b) 1.58 mgd for a proposed "agricultural reserve".

a. "Agricultural Water Use Permits"

The 10.64 mgd for "agricultural water use permits" is based on acreages determined to have "existing uses allowed to continue" as addressed in Orders 8 and 10 resulting from the "existing use hearings" during the Waiahole proceedings. The 10.64 mgd is based on the 4,915 "existing use" acres times the lesser of 2,500 gad or the requested use (see Table 2). The original "existing uses allowed to continue" included agricultural uses only on "footprint" lands. The Commission in this order authorizes "agricultural water use permits" for the use of Waiahole Ditch system water to include agricultural lands which were not part of the original "footprint" lands, but were identified by the Joint Applicants in the "Clarification Letter" of October 2, 1995.

b. Proposed "Agricultural Reserve"

The 1.58 mgd for the proposed "agricultural reserve" is based on the non-permitted balance of the 12.22 mgd "agricultural uses". Formal rule making procedures to establish an "agricultural reserve" will be conducted after the contested case proceedings. When established by rule making, the agricultural reserve will be available for any agricultural uses through the water use permit process. If a contested case hearing is requested during the water use permit process for a reserved amount, standing will be determined mainly among competing agricultural users, thereby limiting the scope, duration, and expense of the proceeding.

4. Agricultural water use permits may use Waiahole Ditch water on the fields, acreages, and TMKs listed on Tables 2 to 4. Table 4 is modified after Exhibit A of the applicant's "Clarification Letter" dated October 2, 1995, and includes proposed agricultural uses, on lands both within and outside the original "footprint" lands.

5. The 10.64 mgd agricultural water use permits which are based on requested usage amounts or 2,500 gad, which exceed their allocations, may apply for increased allocations from the 1.58 mgd proposed agricultural reserve on a case-by-case basis and upon showing of actual need.

6. New agricultural uses on lands zoned for agriculture, may apply for water use permits from the 1.58 mgd proposed agricultural reserve.

7. Uses of water for golf courses, parks, and landscape irrigation are not considered agricultural uses.

8. "Double counting" of water allocations shall not be allowed. That is, an applicant who receives a water use permit to use Waiahole Ditch water on certain lands will not continue to be allowed to use Pearl Harbor ground water on the same lands, unless authorized by the Commission. The Commission is aware that there are water use permits for ground water from the Waipahu-Waiawa aquifer system, formerly used on lands mauka of H-1 Freeway, which can be suspended or revoked after four years of partial or total nonuse.

F. Water Use Permits

1. Water use permits for agricultural uses, both existing and proposed, are approved and shall be issued to the landowners as follows:

a. Campbell's request to use 12.09 mgd is granted in part and denied in part. Campbell is granted a water use permit for 5.28 mgd for 3,767 acres on lands (TMKs) listed on Table 4. The remaining 6.81 mgd is denied.

b. Robinson's request to use 5.50 mgd is granted in part and denied in part. Robinson is granted a water use permit for 2.49 mgd for 1,854 acres on lands (TMKs) listed on Table 4. The remaining 3.01 mgd is denied.

c. Nihonkai's request to use 0.50 mgd is granted in part and denied in part. Nihonkai is granted a water use permit for 0.48 mgd for 190 acres on lands (TMK 9-4-4:009(por)) listed on Table 4. The remaining 0.02 mgd is denied.

d. Castle & Cooke, Inc.'s (formerly Dole/Castle & Cooke) request to use 2.22 mgd is granted in part and denied in part. Castle & Cooke, Inc. is granted a water use permit for 2.12 mgd for 1,552 acres on lands (TMKs) listed on Table 4. The remaining 0.10 mgd is denied.

e. KSBE's request to use 4.2 mgd is granted in part and denied in part. KSBE is granted a water use permit for 0.17 mgd for 150 acres on lands (TMKs) listed on Table 4. The remaining 4.03 mgd is denied. KSBE has correlative rights to ground water underlying its land. KSBE may apply for additional water uses upon proper land use approvals and when actual use will commence within a reasonable time frame for a given project.

2. Water use permits for existing non-agricultural uses are approved and shall be issued to the landowners as follows:

a. The State of Hawaii's Waiawa Correctional Facility is granted a water

use permit for 0.15 mgd for domestic and irrigation uses for 210 acres on the lands (TMKs) listed on Table 3.

b. Mililani Memorial Park is granted a water use permit for 0.14 mgd for cemetery use for 67 acres on lands (TMKs) listed on Table 3.

c. Mililani Golf Club is granted a water use permit for 0.25 mgd for golf course use for 165 acres on lands (TMK 9-5-01:35) as listed on Table 3.

3. Water use permits for the following "new uses" are approved and shall be issued to the landowners as follows:

a. Dole/Castle & Cooke and Robinson's request to use 0.14 mgd is granted in part and denied in part. Dole/Castle & Cooke and Robinson, as joint applicants, are granted a water use permit for 0.1 mgd for agricultural use for the "Banana Patch" parcel at TMK 9-4-3:003, (previously listed under lessee Eiko Nakama on Table 4). The remaining 0.04 mgd is denied. Water was used for diversified agriculture on the parcel in 1992. The allocation of 0.1 mgd is based on 40 acres x 2,500 gad = 0.1 mgd. The allocation is to go to the joint applicants because water is supplied through the Dole/Castle & Cooke system and is used on the parcel which is owned by Robinson.

b. Royal Oahu Resort, Inc., by letter dated April 11, 1997, withdrew its application for a water use permit. Royal Oahu has completed and is now drawing water from its on-site well (Well No. 2401-07). Royal Oahu's application is therefore moot.

c. Puu Makakilo applied for a golf course (non-agricultural) use over the basal aquifer. Its request to use 0.75 mgd is granted. It is granted a water use permit for 0.75 mgd for golf course use at TMK 9-2-3:074, as listed on Table 3. Puu Makakilo was using water for golf course construction in 1992. Puu Makakilo requested 0.75 mgd for golf course irrigation. If treated wastewater may be used in compliance with DOH standards over the basal aquifer and such treated wastewater can be reasonably obtained, then Puu Makakilo shall use treated wastewater as soon as possible. If and when treated wastewater is available, acceptable, and affordable for use, the Commission reserves the right, after a hearing, to revoke this permit.

4. The Commission finds that a water use permit is required for use of water in the McCandless Pipeline. Sufficient evidence has not been presented to determine who the applicant should be. The Commission staff is directed to research the matter and have the appropriate party apply.

5. Any portion of water subject to a water use permit, or allowed for operational losses, that is not being used, shall be released into windward streams at locations determined by the Commission.

6. The water use permits granted by this order are subject to the standard water use permit conditions and special conditions listed in Attachments A and B.

7. All permits shall be subject to review at any time and shall be reviewed within 5 years, or sooner if deemed necessary, for compliance with conditions of the permits, including evaluation of the reasonableness of the 2500 gad.

8. In the event that the tax map key at the location of the water use is changed, the permittee shall notify the Commission in writing of the tax map key change within thirty (30) days after receiving notice of the change.

9. The permittees on whose lands the water from the Waiahole Ditch system is used shall prepare, or contract for, a portion of the studies and monitoring activities resulting from this order (see, for example, In re: Mono Lake, Decision 1631, State of California Water Resources Control Board, 9/20/94, page 211, ¶8e). Funding shall be based on the amount of water used and shall be on a pro rata basis. The Commission shall establish a committee to recommend a reasonable amount for the funding, and coordinate and set up the mechanism for the collection, accounting, and distribution of the funds. The committee shall submit its findings and recommendations to the Commission for approval within eight(8) months from the date the Final Decision and Order is issued.

10. Water use permits denied.

a. The water use permit application for the Department of Agriculture's Agricultural Park for use of 0.75 mgd (see Table 5) of Waiahole Ditch system water over the basal aquifer is denied without prejudice to reapply when DOA can demonstrate that actual use will commence within a reasonable time frame.

b. The water use permit application for West Beach Estates (WBE) to use 1.64 mgd (see Table 5) of Waiahole Ditch system water is denied. WBE did not sufficiently establish that their proposed use is a reasonable beneficial use. The water use permit application for WBE for use of Waiahole Ditch water over the brackish Ewa caprock aquifer is denied for the following reasons: 1) WBE was not using Waiahole Ditch water in 1992; 2) WBE is located over the brackish Ewa caprock aquifer where the use of treated effluent is not objected to by any entity and is now formally encouraged; and 3) WBE did not present sufficient evidence concerning the timetable indicating when the water would be needed.

WBE should use Honouliuli treated effluent if it can be reasonably obtained.

c. Waiahole Irrigation Co.'s request for 2.0 mgd of Waiahole Ditch system water as operational losses is denied (see Table 5). However, provision is made elsewhere for such operational losses (see Section I.).

#### G. Non-Permitted Ground Water

1. It is the intent of the Commission that the non-permitted ground water be released into the streams in order that baseline data be collected on the effects of the increased stream flows and later stream flow change on the streams.

2. Any person requesting a permit from the 5.39 mgd non-permitted ground water must apply for a water use permit as provided by the Water Code and administrative rules. The applicant will not be required to petition to amend the interim instream flow standard. The non-permitted ground water flow may be considered for offstream uses (unless the offstream use may be accommodated from the proposed agricultural reserve). Scientific studies under the Commission's supervision will be the basis for deciding how much, if any, of the non-permitted ground water may be used offstream.

3. When a water use permit application for water from the non-permitted ground water is filed and before any permit is approved, the Commission will review the best available scientific and stream flow data. If any water use permits are issued from the non-permitted ground water, the permits will be subject to conditions providing for stream restoration if the Commission determines that additional water should be returned to the stream.

4. The applicant must also demonstrate that actual use will commence within a reasonable time frame.

#### H. Implementation Plan

The agricultural parties, with the cooperation and participation of Waiahole Irrigation Company and the Department of Agriculture, shall draft an Implementation Plan incorporating the principles of the "Farm Delivery Agreement" to form a cooperative to coordinate and facilitate the delivery of water. Waiahole Irrigation Company shall submit the draft plan, for review and approval by the Commission, within six (6) months after the issuance of the Final Decision & Order.

#### I. Operational Losses

The request by the Waiahole Irrigation Co. for a water use permit for 2.0 mgd of Waiahole Ditch system water as operational losses is denied (see Table 5 and section F.10.c). However, the Commission recognizes that operational losses occur and an allowance shall be made for operational losses from evaporation and leakage, as well as losses due to other operational requirements of the system. Such losses and operational requirements shall be identified and addressed in the proposed implementation plan (see section H) and shall continue to be reported to the Commission.

Until such time that the Kahana watershed is designated as a surface water management area, and until such time that there is a request to use Kahana surface water, the Commission will recognize that 2.1 mgd from Kahana approximates operational losses (see section D.2.). When Kahana surface water is permitted, the Commission may consider deducting the operational losses from the non-permitted ground water.

J. Leeward Uses Measured at Adit 8.

The leeward uses shall be as measured at Adit 8, and shall be the quantity of water use averaged over a twelve-month period, otherwise called the twelve month moving average (12-MAV). The 12-MAV allows for seasonal fluctuation, and is generally used for all water use reporting requirements by the Commission.

K. Alternate Sources of Water

This Commission believes that Oahu's remaining ground-water resources must be directed to its highest and best use. There must be an increased emphasis on water conservation, water reclamation and reuse, and system efficiency improvements. One way to stretch Oahu's remaining resources is to utilize lower quality water, such as reclaimed water and brackish caprock water, for irrigation purposes, replacing the use of higher quality ground water. Even if reclaimed water is not available currently, this Commission will revisit and, if appropriate, reduce existing ground-water permits if reclaimed water becomes available and is allowable, subject to economic and health considerations. In particular, the permittees near Kunia Road are urged to convert to reclaimed water upon construction of the Army's R-1 pipeline from Schofield to Honouliuli.

L. Summary of Waiahole Ditch System Flows

In summary, 27 mgd of water in the Waiahole Ditch system shall be allocated as follows (see Figure A):

	<u>Offstream</u>	<u>Unpermitted (Remains in stream)</u>	<u>Instream</u>
Instream Flow Restoration			6.00 mgd
Permitted Agricultural Uses	10.64 mgd		
Permitted Other Uses	1.29 mgd		
Proposed Agricultural Reserve	← — — — — 1.58 mgd (subject to permitting)		
Non-permitted Ground Water (subject to permitting)		5.39 mgd	
Non-regulated Kahana Surface Water	2.10 mgd		
Total (mgd)	14.03	6.97	6.00

M. Public Trust Doctrine

A more comprehensive discussion of the public trust doctrine and its incorporation into the Water Code and these proceedings is presented in the Commission's Conclusions of Law (Section B, pages 5 to 10).

N. Native Hawaiian Traditional and Customary Practices

A more comprehensive discussion of native Hawaiian traditional and customary practices and its applicability to the Water Code and these proceedings is presented in the Commission's Conclusions of Law, Section E, pages 20 to 22. The Commission concludes that native Hawaiian traditional and customary practices, Hawaiian gathering rights, and Hawaiian cultural and historical values are not being denied. They may continue, will be protected, and, in fact, will be enhanced to the extent that higher interim instream base flows and supplemental flows affect traditional and customary practices.

O. Reservations

Under Hawaii's Water Code, Hawaii Revised Statutes (Haw. Rev. Stat.), § 174C-49(d), and the Commission's Administrative Rule (HAR), § 13-171-1313(d), reservations of water are conducted as rule making procedures under Haw. Rev. Stat. chapter 91.

The Commission will be proposing a 1.58 mgd agricultural reserve and will commence the rule making procedure for this amount. The Commission has taken notice of petitions that have been filed to reserve water. However, as stated in Order Number 9, Item 3, the Commission will consider reservation requests for general categories of use, rather than for specific parties. Hawaiian home lands constitute a special case due to the specific provisions of the Hawaiian Homes Commission Act (section 221) and the Hawaii Admission Act (section 4). Formal action on reservation petitions will take place in later, separate, and publically noticed meetings after the contested case proceedings. Any person may file a petition to reserve water which would be taken up in later rule-making proceedings.

P. Actions on Outstanding Motions

After consideration of the evidence submitted in the hearing in this matter, and based upon the record and submittals by the parties, the Commission on Water Resource Management (Commission) acts on the following motions as indicated below:

1. MOTION: MOTION BY PETITIONERS WAIAHOLE-WAIKANE COMMUNITY ASSOCIATION, HAKIPUU OHANA, KAHALUU NEIGHBORHOOD BOARD, AND KA LAHUI HAWAII TO STAY WAIAHOLE DITCH COMBINED CONTESTED CASE HEARING PENDING COMMISSION INVESTIGATION OF ALTERNATIVE SOURCES AND SOLUTIONS (5/15/95)

ACTION: The Commission originally heard the motion on July 27, 1995, and held the motion for further consideration (Order No.6, item 6). The Commission now denies the motion.

2. MOTION: MOTION BY WAIAHOLE-WAIKANE COMMUNITY ASSOCIATION, HAKIPUU OHANA, KAHALUU NEIGHBORHOOD BOARD, AND THE OFFICE OF HAWAIIAN AFFAIRS TO DISMISS THE DEPARTMENT OF LAND AND NATURAL RESOURCES AS A CO-APPLICANT IN WAIAHOLE IRRIGATION COMPANY'S AND DEPARTMENT OF LAND AND NATURAL RESOURCES' JOINT WATER USE PERMIT APPLICATION (6/27/95)

ACTION: The Commission originally heard the motion on August 15, 1995, and deferred the motion (Order No. 9, item 4). The Commission now denies the motion.

3. MOTION: OFFICE OF HAWAIIAN AFFAIRS' RENEWED MOTION TO MEMORIALIZE THE RECORD (9/11/95)

ACTION: On September 11, 1995, the Office of Hawaiian Affairs (OHA) filed its Renewed Motion to Memorialize the Record regarding a communication at the June 13, 1995 meeting of the Commission.

The subject of the Commission meeting was whether an interim agreement among most of the Waiahole parties for the release of water to windward Oahu streams would be extended two weeks from June 13, 1995 to June 30, 1995 while the existing use hearings were being conducted.

During the meeting the Deputy Attorney General for the Commission, William M. Tam, spoke with Mr. Bert Hatton and Yvonne Izu, Esq., representatives of Applicant, Waiahole Irrigation Co. (WIC).



The Commission furnished a transcript of the meeting to OHA and the other Waiahole parties. OHA's renewed motion seeks further clarification.

The attached affidavit of William M. Tam, dated July 26, 1996, and served to the parties on July 29, 1996, clarifies that no substantive matter was discussed. The entire substance of the communication was an inquiry whether WIC would be willing to make any commitment at all (regardless of its terms). The answer was "No." There was no further communication.

That answer was communicated to both the Commission and the parties.

The Commission denies the motion.

4. MOTION: KAMEHAMEHA SCHOOLS BERNICE PAUAHI BISHOP ESTATE'S (KSBE) MOTION TO BIFURCATE KSBE FROM THIS COMBINED CONTESTED CASE PROCEEDING (2/13/96)

ACTION: On February 13, 1996, KSBE moved to bifurcate itself from the Waiahole combined contested case proceedings. By Order Number 6, dated August 7, 1995, the Commission denied the PROPOSED ORDER BIFURCATING WATER USE PERMIT APPLICATIONS FOR PEARL HARBOR GROUNDWATER FILED BY CWRM STAFF ON 7/14/95, which, if approved, would have bifurcated KSBE from these proceedings. In light of the interrelated nature of competing claims which mitigate in favor of the combined process, and after consideration of the evidence and pleadings and record in this matter, the Commission hereby denies KSBE's motion to bifurcate.

Q. ORDER ADMITTING OR REJECTING PARTIES' EXHIBITS INTO THE  
RECORD

After consideration of the evidence submitted in the hearing in this matter, and based upon the record and submittals by the parties, the Commission admits or rejects the following exhibits:

1. LEEWARD JOINT PARTIES

WAIAHOLE IRRIGATION COMPANY

a. Admitted

A-1 to A-4, A-9, A-100 to A-102, A-200 to A-204, A-R-1, A-R-3, A-R-4, A-R-6, A-R-100 to A-R-101, A-R-101a, A-R-102, A-R-103, A-R-300, A-R-301, A-R-400, A-R-600 to A-R-615, A-R-615a to A-R-615d, A-R-616, A-R-616a to A-R-616d, A-R-617 to A-R-619, A-SR-2, A-SR-100, A-SR-200 to A-SR-204

2. Rejected - none

CAMPBELL ESTATE

a. Admitted

B-1 to B-38

b. Rejected - none

ROBINSON ESTATE

a. Admitted

H-1 to H-15

b. Rejected - none

DOLE/CASTLE & COOKE

a. Admitted

K-1 to K-18

b. Rejected - none

2. PUU MAKAKILO

a. Admitted

E-1 to E-47

- b. Rejected - none
- 3. NAVY
  - a. Admitted  
F-1 to F-9, F-11, F-12
  - b. Rejected - none
- 4. NIHONKAI
  - a. Admitted  
G-1 to G-10
  - b. Rejected - none
- 5. WEST BEACH
  - a. Admitted  
I-1 to I-3
  - b. Rejected - none
- 6. KS/BE
  - a. Admitted  
J-3 to J-42, J-44 to J-47, J-53 to J-64, J-66 to J-73, J-79, J-80, J-82 to J-85, J-92 to J-117
  - b. Rejected  
J-1, J-2, J-86 to J-91
- 7. DEPARTMENTS OF AGRICULTURE/LAND AND NATURAL RESOURCES
  - a. Admitted  
L-100, L-101, L-200 to L-203, L-205, L-300, L-400, L-401, L-500, L-600, L-601, L-700, L-900, L-901, L-902
  - b. Rejected  
L-204-RT, L-510-SUR, L-701-SUR, L-800, L-1000-RT, L-1001

8. OHA

a. Admitted

M-1 to M-8, M-8A, M-9, M-10, M-10A, M-11 to M-15, M-15A, M-16, M-16A, M-17, M-17A, M-17B, M-18 to M-20, M-20A, M-21 to M-25, M-25A, M-26 to M-36, M-36A to M-36D, M-37 to M-39, M-39A, M-40 to M-43, M-43A, M-44 to M-46, M-46A, M-47, M-48, M-48A, M-49, M-49A, M-50 to M-86, M-86A, M-86B, M-87 to M-92, M-92A, M-92B, M-93 to M-96, M-96A, M-97 to M-101, M-101A, M-102 to M-104, M-104A, M-104B, M-105 to M-109, M-109A, M-110, M-111, M-111A, M-112 to M-114, M-114A, M-115 to M-127, M-135, M-136, M-138 to M-155, M-155A, M-156 to M-166

b. Rejected

M-128 to M-134, M-137

9. WWCA

a. Admitted

N-3 to N-48, N-51 to N-55, N-58 to N-60, N-62 to N-91, N-93, N-95 to N-100, N-104, N-106 to N-109, N-111, N-113 to N-115, N-117 to N-127, N-130, N-131, N-134, N-136, N-139A to N-139H, N-140 to N-142, N-147, N-148, N-150 to N-157, N-159 to N-165, N-167 to N-171, N-171A, N-172 to N-180, N-183 to N-194, N-195A, N-195B, N-196, N-197A, N-198, N-199 to N-202, N-203(previously N-198), N-204(previously N-202), N-205 to N-210(previously N-201), N-220, N-221

b. Rejected

N-61, N-94, N-101 to N-103, N-132, N-133, N-197B

10. DHHL

a. Admitted

O-100

b. Rejected - none

11. PLANNING DEPARTMENT OF THE CITY AND COUNTY OF HONOLULU

a. Admitted

S-1, S-2a to S-2i, S-3 to S-52

b. Rejected - none

12. BOARD OF WATER SUPPLY OF THE CITY AND COUNTY OF HONOLULU

a. Admitted

T-1 to T-120, T-120a to T-120c, T-121 to T-163, T-164a, T-164b, T-165 to T-178

b. Rejected - none

13. HAWAII'S THOUSAND FRIENDS

a. Admitted

U-7 to U-14

b. Rejected - none

14. ROYAL OAHU RESORT

a. Admitted

X-1 to X-31

b. Rejected – none

Table 1. Waiahole Ditch System Flows (mgd)

Source	1938-1978 Data	WIC 1989-1993 Data	Adjusted Basis
Kahana Tunnel	3.59	2.6	* 1.1
Waikane #2	1.12	1.1	1.1
Waikane #1	4.55	4.2	4.2
Uwau Tunnel	12.97	13.5	13.5
Tunnel to N. Portal plus Kahana Surface Water	5.65	**3.4	**3.4
Main Tunnel: N. Portal to Adit 8	4.79	3.7	3.7
TOTALS (Measured at Adit 8)	32.67	28.5	27.0

\* Adjusted for Kahana Bulkhead constructed in 1992 ( $2.6 - 1.5 = 1.1$ )

\*\* Tunnel to N. Portal (1.3) plus Kahana surface water (2.1)

Table 2. Waiahole Ditch System - Leeward Oahu Agricultural Water Use Permits

Landowner	User/Lands	Use	Acreage	Acreage Subtotal	Basis (GAD)	Allocation	Allocation Subtotal
Robinson	Jefts Sou	Div Ag	620	995	2500	1.55	2.49
		Div Ag	375		2500	0.94	
Nihonkai	Sou	Div Ag	190	190	2500	0.48	0.48
Campbell	156,140,172	Div Ag	803	2109	2500	2.01	5.28
	105,110	Div Ag	409		2500	1.02	
	HSPA	Div Ag	78		2500	0.20	
	166,146	Div Ag	344		2500	0.86	
	115,116,145,161	Div Ag	475		2500	1.19	
Dole/Castle & Cooke  (Robinson)	Dole Fresh Fruit Co.	Div Ag	925	1552	904 (requested)	0.84	2.22
	Hawaii Ag Park	Div Ag	97		2500	0.24	
	Pacific Landscape	Div Ag	22		500 (requested)	0.01	
	Hawaiian Foliage	Div Ag	468		2200 (requested)	1.03	
	Eiko Nakama	Div Ag	40		2500	0.10	
KSBE	Waiawa Nursery HFP	Div Ag	36	69	2500	0.09	0.17
		Div Ag	33		2500	0.08	
TOTAL		DIV AG		4915			10.64

Table 3. Waiahole Ditch System - Leeward Oahu Water Use Permits, Other Uses

Landowner	Use	Acreage	Tax Map Key	Basis (GAD)	Allocation	Allocation Subtotal
State of Hawaii (Waiawa Corr. Fac.)	Dom, Irr	210	9-6-5:011 9-6-5:012	requested @ 714	0.15	0.15
Mililani Memorial	Cemetery	67	9-4-6:10p 9-4-33:01	requested @ 2085	0.14	0.14
Mililani Golf	Golf Course	165	9-5-01:35	requested @ 1500	0.25	0.25
Royal Oahu Resort	Golf Course	163	9-2-4:046	N/A	0.00	0.00
Puu Makakilo	Golf Course	230	9-2-3:074	requested @ 3261	0.75	0.75
TOTAL	OTHER USES	835				1.29



Table 4. Waiahole Ditch System - Leeward Oahu Water Use Permits, Agricultural Lands and Allocations

Landowner	Use	Tax Map Key	Acreage	Acreage Subtotal	Water Use Permit Allocation
Campbell (current use)	Agriculture	9-2-1:001(por)	1,579	2,109	
		9-2-2:001(por)	185		
		9-2-4:005(por)	292		
		9-3-4:006(por)	53		
	Pasture	9-2-4:005(por)	179	500	
		9-2-4:006(por)	321		
Campbell (Red Lands)	Agriculture	9-2-1:001(por)	153	557	
		9-2-2:001(por)	57		
		9-2-4:005(por)	347		
Campbell (New Use)	Agriculture	9-2-4:001(por)	273	601	
		9-2-4:003(por)	20		
		9-2-4:005(por)	113		
		9-2-4:006(por)	55		
		9-2-5:002(por)	140		
TOTAL CAMPBELL				3,767	5.28
Robinson	Agriculture	9-4-3:001(por)		1,443	
		9-4-3:009(por)			
		9-4-4:004(por)			
		9-4-4:010(por)			
		9-4-4:012(por)			
		9-4-4:019(por)			
	Agriculture	9-4-3:001(por)		411	
		9-4-4:004(por)			
		9-4-4:007(por)			
		9-4-4:010(por)			
9-4-4:011(por)					
TOTAL ROBINSON				1,854	2.49
Nihonkai	Agriculture	9-4-4:009(por)	190	190	
TOTAL NIHONKAI				190	0.48

Dole/Castle & Cooke (Dole Fresh Fruit)	Agriculture	9-4-5:074 9-4-6:001 9-5-3:004		925	
Dole/Castle & Cooke (Hawaii Ag Park)	Agriculture	9-4-3:002(por)		97	
Dole/Castle & Cooke (Pacific Landscape)	Agriculture	9-4-3:002(por)		22	
Dole/Castle & Cooke (Hawaiian Foliage)	Agriculture	9-4-3:002(por) 9-4-5:048(por)		468	
Dole/Castle & Cooke (Banana Patch Parcel - Eiko Nakama)	Agriculture	9-4-3:003		40	
<b>TOTAL DOLE/CASTLE &amp; COOKE</b>				<b>1,552</b>	<b>2.22</b>
KSBE (Waiawa Nursery)	Agriculture	9-6-5:003(por)		50	
KSBE (HFP/Waiawa Nursery Farm)	Agriculture	9-6-5:003(por) 9-6-5:001(por)		100	
<b>TOTAL KSBE</b>				<b>150</b>	<b>0.17</b>

Table 5. Waiahole Ditch System - Requested and Granted Uses

Landowner	Agricultural		Non-Agricultural		TOTAL	
	Existing Use (Requested)	New Use (Requested)	Existing Use (Requested)	New Use (Requested)	Requested	Granted
Campbell	8.26	3.83			12.09 (1)	5.28
Robinson	5.50				5.50 (1)	2.49
Nihonkai	0.50				0.50 (1)	0.48
Dole/Castle & Cooke	2.22				2.22 (2)	2.12
Dole/Castle & Cooke/Robinson * (Banana Patch Parcel - Eiko Nakama)		0.14			0.14 (2)	0.10
KSBE	1.55			2.65	4.20 (3)	0.17
State of Hawaii (Waiawa Corr. Fac.)			0.15		0.15 (1)	0.15
Mililani Memorial			0.14		0.14 (2)	0.14
Mililani Golf			0.25		0.25 (2)	0.25
Royal Oahu Resort				0.75	0.75 (1)	0.00
Puu Makakilo				0.75	0.75 (1)	0.75
Dept. of Agriculture (Halekua)		0.75			0.75 (1)	0.00
Waiahole Irrigation Company (for operational losses)			2.00		2.00 (1)	0.00
West Beach Estates				1.64	1.64 (4)	0.00
<b>TOTAL</b>	<b>18.03</b>	<b>4.72</b>	<b>2.54</b>	<b>5.79</b>	<b>31.08</b>	<b>11.93</b>

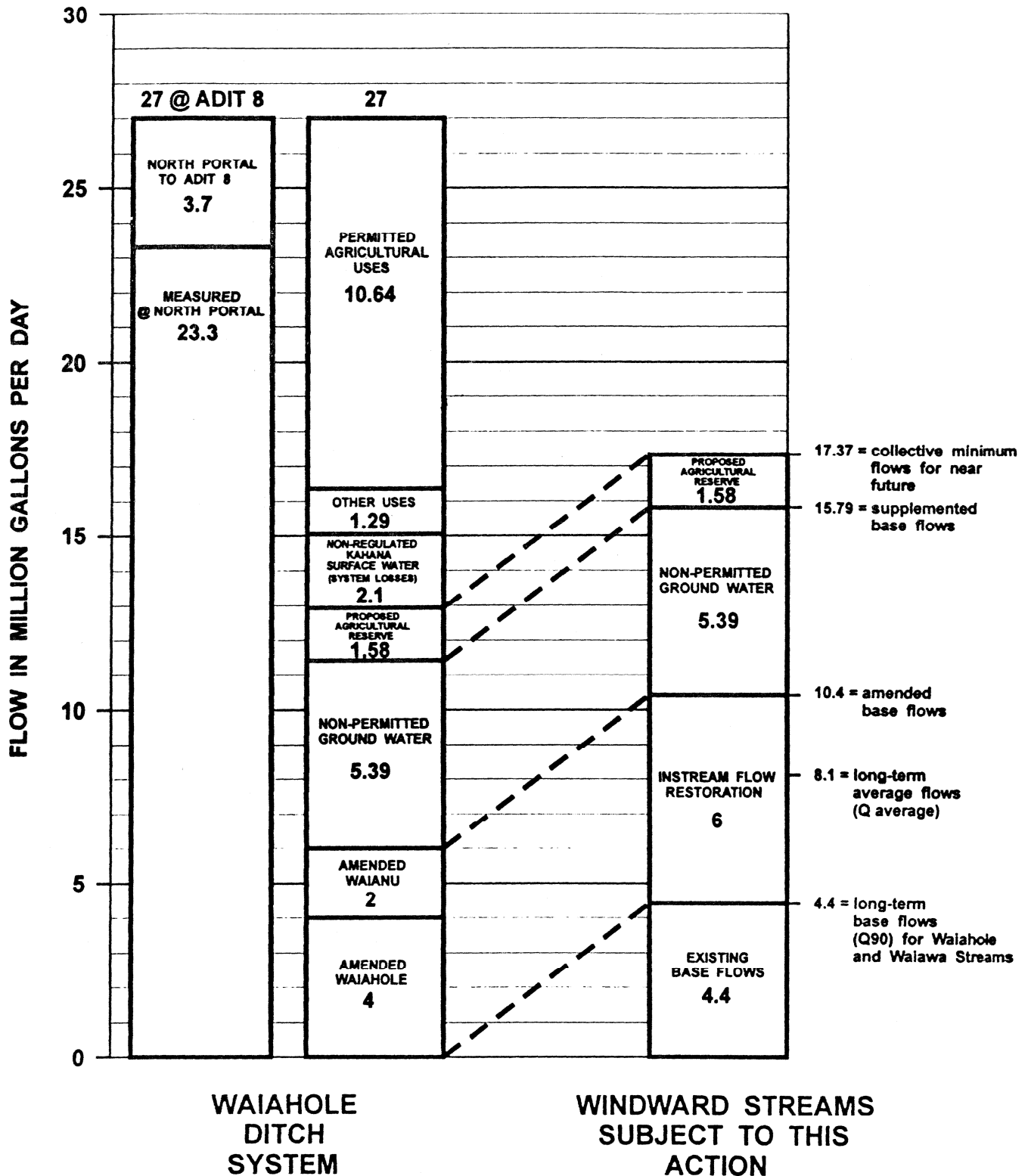
\* Water use permit issued to Dole/Castle & Cooke and Robinson as joint applicants because water is supplied through the Dole/Castle & Cooke system and is used on the parcel which is owned by Robinson.

- (1) "Clarification Letter" dated October 2, 1995.
- (2) Dole/Castle & Cooke Water Use Permit Application dated October 5, 1994.
- (3) KSBE Water Use Permit Application dated September 8, 1994.
- (4) WBE Water Use Permit Application dated January 13, 1995.

FIGURE A

# SUMMARY OF WAIHAOLE DITCH SYSTEM FLOWS

FLOW IN MILLION GALLONS PER DAY



## **STANDARD WATER USE PERMIT CONDITIONS**

1. The water described in this water use permit may only be taken from the location described and used for the reasonable beneficial use described at the location described in this Decision and Order. Reasonable beneficial uses means "the use of water in such a quantity as is necessary for economic and efficient utilization which is both reasonable and consistent with State and County land use plans and the public interest." (Haw. Rev. Stat. § 174C-3)
2. The right to use ground water is a shared use right.
3. The water use must at all times meet the requirements set forth in Haw. Rev. Stat. § 174C-49(a), which means that it:
  - a. Can be accommodated with the available water source;
  - b. Is a reasonable-beneficial use as defined in Haw. Rev. Stat. § 174C-3;
  - c. Will not interfere with any existing legal use of water;
  - d. Is consistent with the public interest;
  - e. Is consistent with State and County general plans and land use designations;
  - f. Is consistent with County land use plans and policies; and
  - g. Will not interfere with the rights of the Department of Hawaiian Home Lands as provided in section 221 of the Hawaiian Homes Commission Act and Haw. Rev. Stat. § 174C-101(a).
4. The ground water use here must not interfere with surface or other ground water rights or reservations.
5. The ground water use here must not interfere with interim or permanent instream flow standards. If it does, then:
  - a. A separate water use permit for surface water must be obtained in the case an area is also designated as a surface water management area;
  - b. The interim or permanent instream flow standard, as applicable, must be amended.
6. The water use authorized here is subject to the requirements of the Hawaiian Homes Commission Act, as amended, if applicable.
7. The water use permit application, as amended, approved by the Commission by this Decision and Order are incorporated into this permit by reference.
8. Any modification of the permit terms, conditions, or uses may only be made with the express written consent of the Commission.

9. This permit may be modified by the Commission and the amount of water initially granted to the permittee may be reduced if the Commission determines it is necessary to:
  - a. protect the water sources (quantity or quality);
  - b. meet other legal obligations including other correlative rights;
  - c. insure adequate conservation measures;
  - d. require efficiency of water uses;
  - e. reserve water for future uses, provided that all legal existing uses of water as of June, 1987 shall be protected;
  - f. meet legal obligations to the Department of Hawaiian Home Lands, if applicable; or
  - g. carry out such other necessary and proper exercise of the State's and the Commission's police powers under law as may be required.

Prior to any reduction, the Commission shall give notice of its proposed action to the permittee and provide the permittee an opportunity to be heard.

10. If the ground water source does not presently exist, the new well shall be completed, i.e. able to withdraw water for the proposed use on a regular basis, within twenty-four (24) months from the date the water use permit is approved.
11. An approved flowmeter(s) **must** be installed to measure monthly withdrawals and a monthly record of withdrawals, salinity, temperature, and pumping times (if applicable) must be kept and reported to the Commission on Water Resource Management on forms provided by the Commission on a **monthly** basis (attached).
12. This permit shall be subject to the Commission's periodic review of the **Waipahu-Waiawa, Kahana, and Koolaupoko** Aquifer Systems' sustainable yields. The amount of water authorized by this permit may be reduced by the Commission if the sustainable yield of the **Waipahu-Waiawa, Kahana, and Koolaupoko** Aquifer Systems, or relevant modified aquifer(s), are reduced.
13. A permit may be transferred, in whole or in part, from the permittee to another, if:
  - a. The conditions of use of the permit, including, but not limited to, place, quantity, and purpose of the use, remain the same; and
  - b. The Commission is informed of the transfer within ninety days.

Failure to inform the department of the transfer invalidates the transfer and constitutes a ground for revocation of the permit. A transfer which involves a change in any condition of the permit, including a change in use covered in Haw. Rev. Stat. § 174C-57, is also invalid and constitutes a ground for revocation.

14. The use(s) authorized by law and by this permit do not constitute ownership rights.

15. The permittee shall request modification of the permit as necessary to comply with all applicable laws, rules, and ordinances which will affect the permittee's water use.
16. The permittee understands that under Haw. Rev. Stat. § 174C-58(4), that partial or total nonuse, for reasons other than conservation, of the water allowed by this permit for a period of four (4) continuous years or more may result in a permanent revocation as to the amount of water not in use. The Commission and the permittee may enter into a written agreement that, for reasons satisfactory to the Commission, any period of nonuse may not apply towards the four-year period. Any period of nonuse which is caused by a declaration of water shortage pursuant to section Haw. Rev. Stat. § 174C-62 shall not apply towards the four-year period of forfeiture.
17. The permittee shall prepare and submit a water shortage plan within 30 days of the issuance of this permit as required by HAR § 13-171-42(c). The permittee's water shortage plan shall identify what the permittee is willing to do should the Commission declare a water shortage in the **Waipahu-Waiawa, Kahana, and Koolaupoko** Ground Water Management Areas.
18. The water use permit granted shall be an interim water use permit, pursuant to HAR § 13-167-3(6). The final determination of the water use quantity shall be made within five years.
19. The water use permit shall be subject to the Commission's establishment of instream standards and policies relating to the Stream Protection and Management (SPAM) program, as well as legislative mandates to protect stream resources.
20. The permittee understands that any willful violation of any of the above conditions or any provisions of Haw. Rev. Stat. § 174C or HAR § 13-171 may result in the suspension or revocation of this permit.

### **SPECIAL WATER USE PERMIT CONDITIONS**

1. Standard Conditions 10 is waived.
2. Standard Condition 11 is modified to exempt the permittee from monthly measurements of salinity and temperature.
3. This permit shall be subject to conditions providing for stream restoration if the Commission determines that additional water should be returned to the streams.
4. This interim water use permit shall cease to be interim and shall become subject to Haw. Rev. Stat. § 174C-55 upon review of the quantity within 5 years, provided that all conditions of the use (including the review of the quantity which shall not be greater than the amount initially granted) remain the same.

ATTACHMENT B

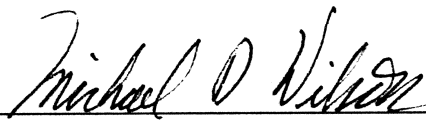


The foregoing Findings of Fact, Conclusions of Law, and Decision and Order in the Waiahole Ditch Combined Contested Case Hearing, Case No. CCH-OA95-1, are hereby adopted.


IT IS SO ORDERED.

DATED: HONOLULU, HAWAII, DEC 24 1997

COMMISSION ON WATER RESOURCE MANAGEMENT  
STATE OF HAWAII

By:   
MICHAEL D. WILSON, Chairperson  
Chairperson of the Commission on Water Resource  
Management and Presiding Officer

  
LAWRENCE MIIKE, Commissioner

 H Cox  
RICHARD H. COX, Commissioner

  
DAVID NOBRIGA, Commissioner